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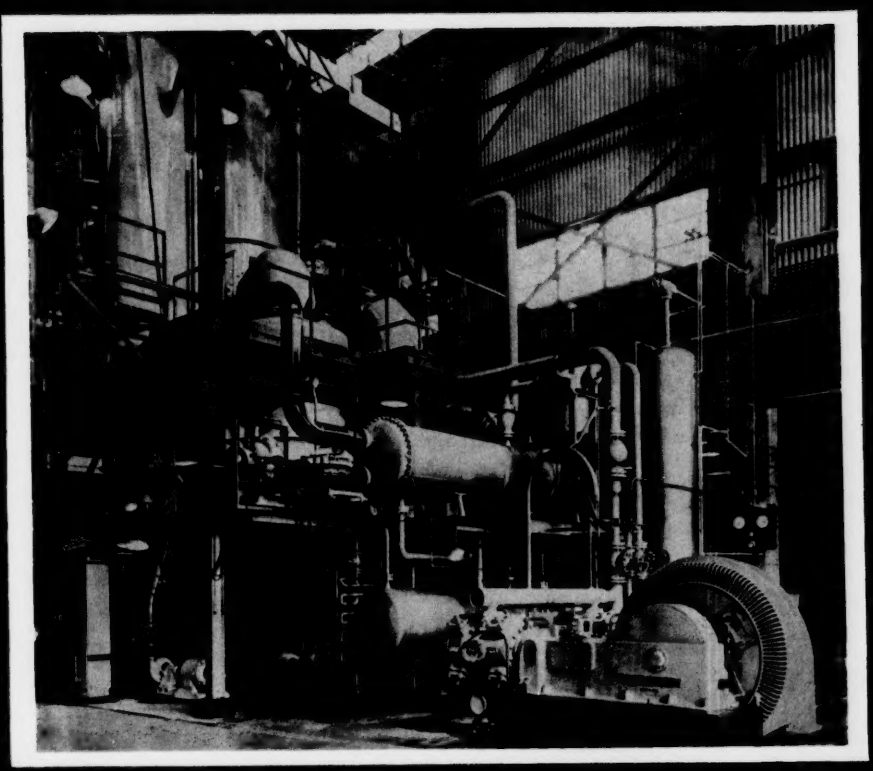

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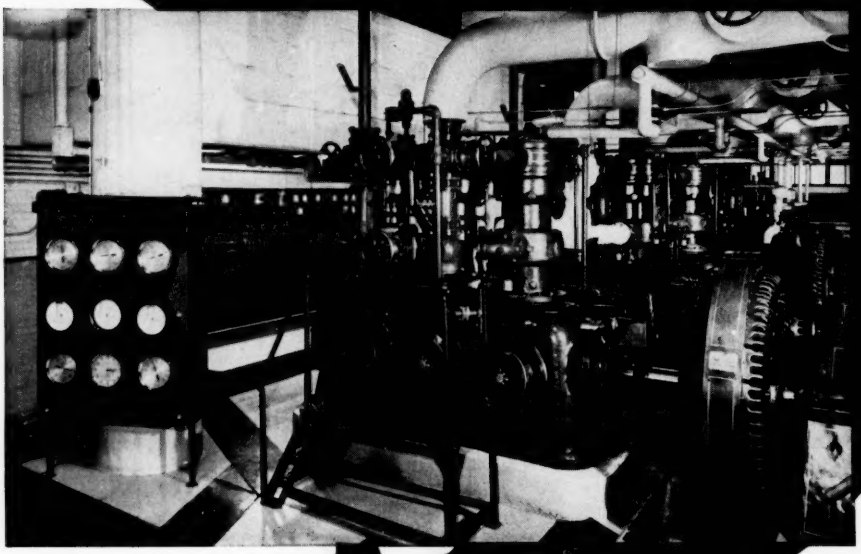
LOW TEMPERATURES AT LOWER COST



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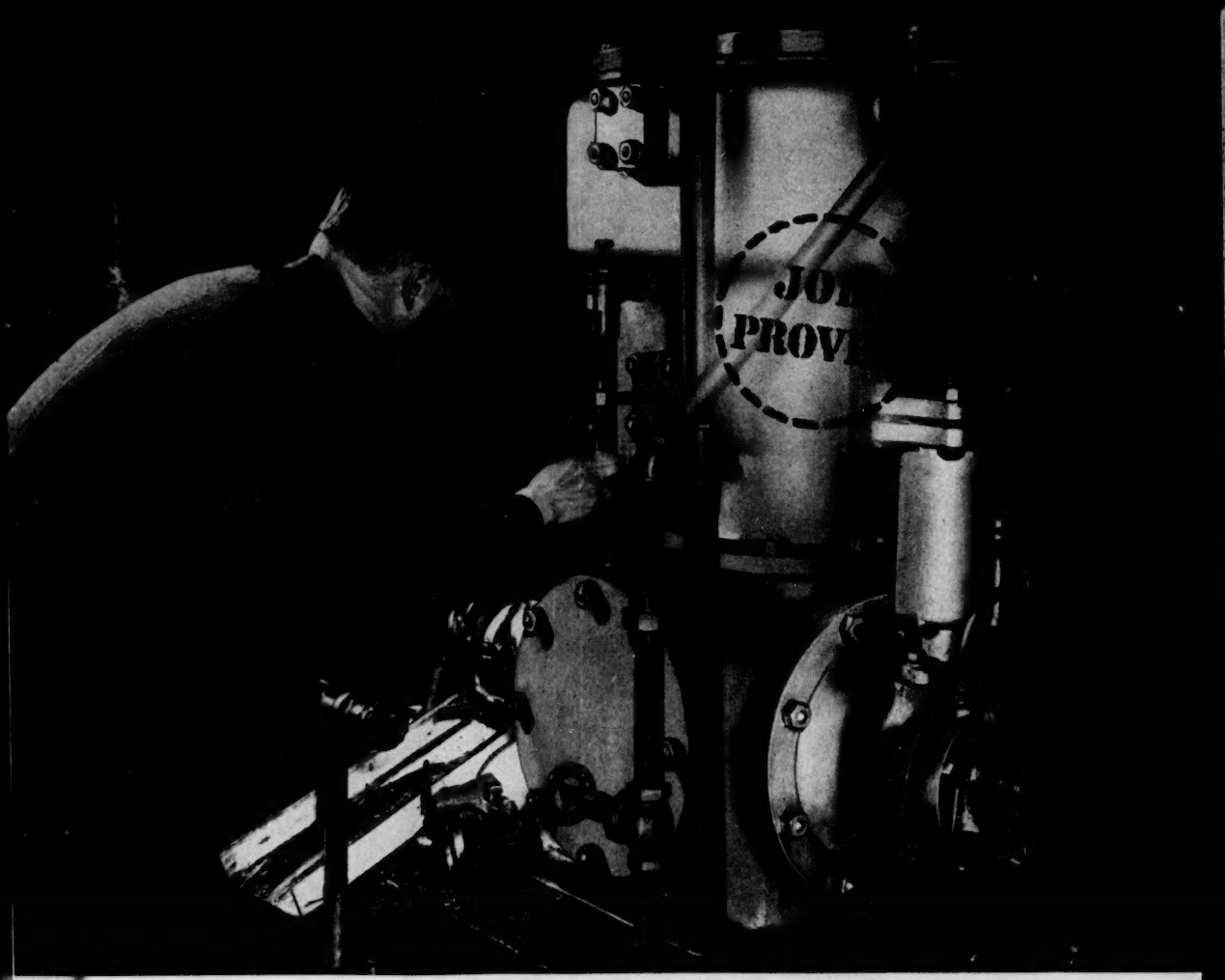

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VOLUME 119 NUMBER 2

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August 1950

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ATTN ALL ICE MANUFACTURERS U S A

THE SWIFTNESS WITH WHICH THE KOREAN SITUATION DEVELOPED LEADS US TO BELIEVE THAT OUR INTERNAL BUSINESS AFFAIRS COULD CHANGE FOR BETTER OR WORSE ALMOST OVERNIGHT.

THE SITUATION IS GRAVE ENOUGH TO WARRANT ICE MANUFACTURERS TO EXAMINE THEIR ICE SCORING EQUIPMENT AND TO PROVIDE REPLACEMENTS, NEW MACHINES OR REPAIR PARTS NECESSARY TO INSURE CONTINUED EFFICIENT SERVICE SHOULD AN EMERGENCY ARISE. IN APPRECIATION OF THE BUSINESS OF OUR GOOD CUSTOMERS, WE URGE YOU TO DO THIS NOW. WE URGE YOU EQUALLY AS STRONG, HOWEVER, NOT TO OVER BUY FOR TO DO SO MIGHT IMPOSE A HARDSHIP UPON SOME OF YOUR FELLOW ICE MANUFACTURERS.

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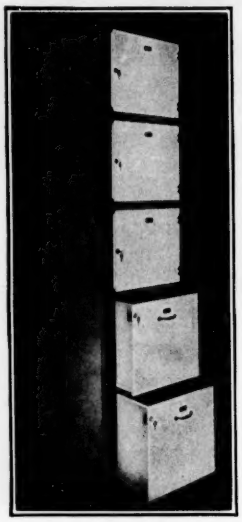

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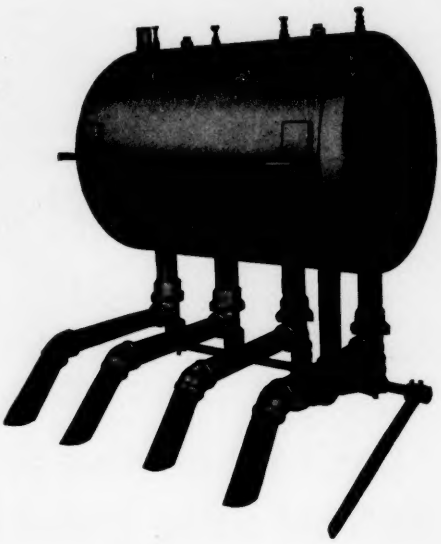

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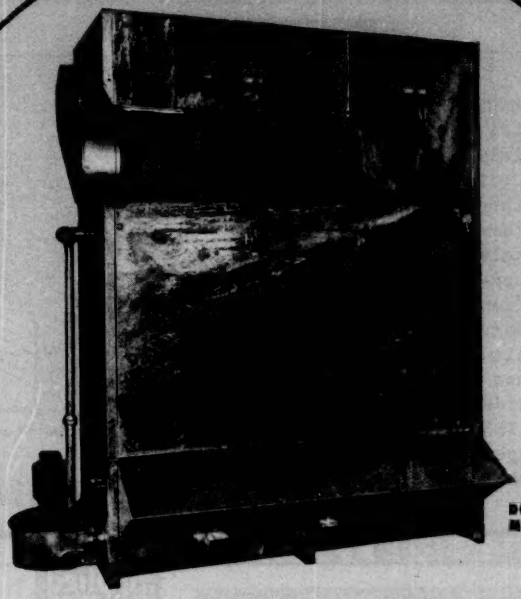

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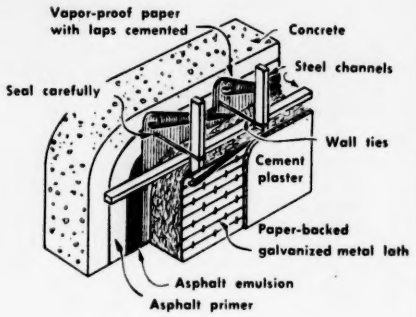

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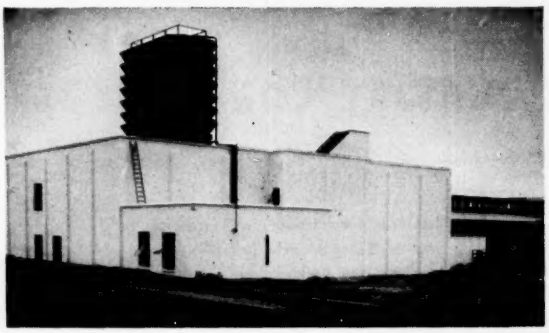

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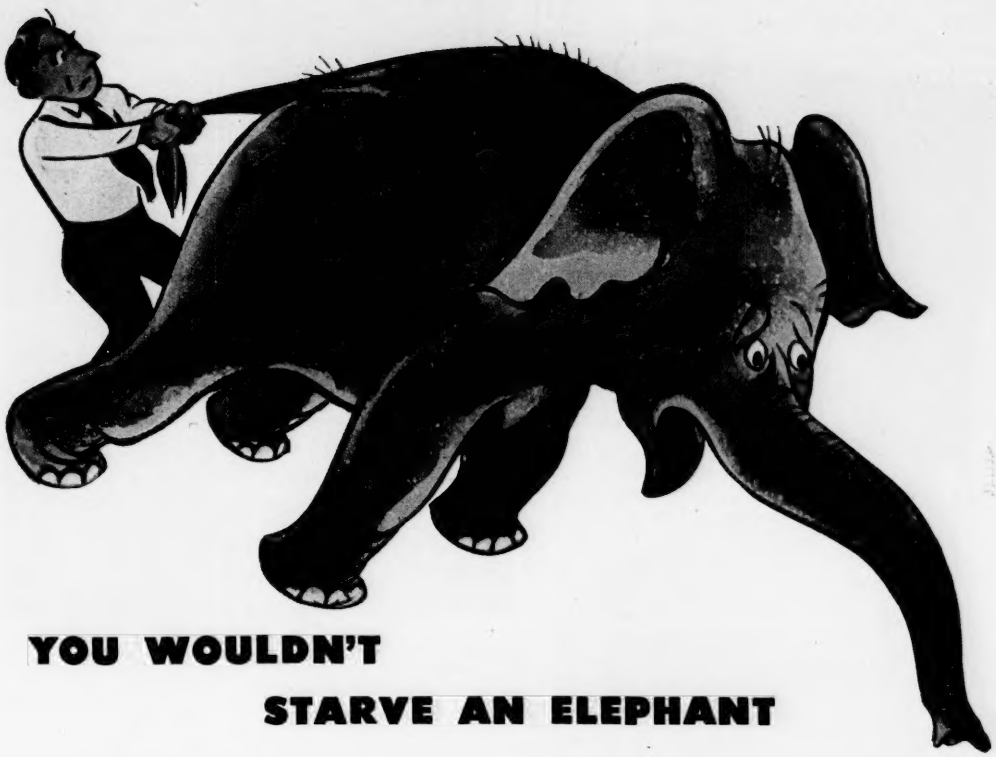

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No, and it's just as unsound to risk loss of valuable machinery and production for the sake of saving "peanuts" on initial oil costs. For lubrication is not just "oils and greases" . . . it's also knowledge of machinery, the right lubricants to use, and where and how to use them.

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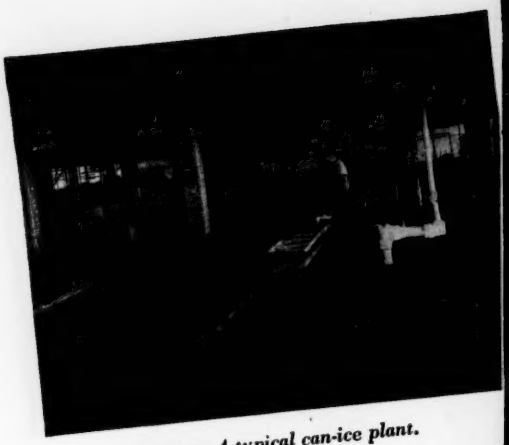
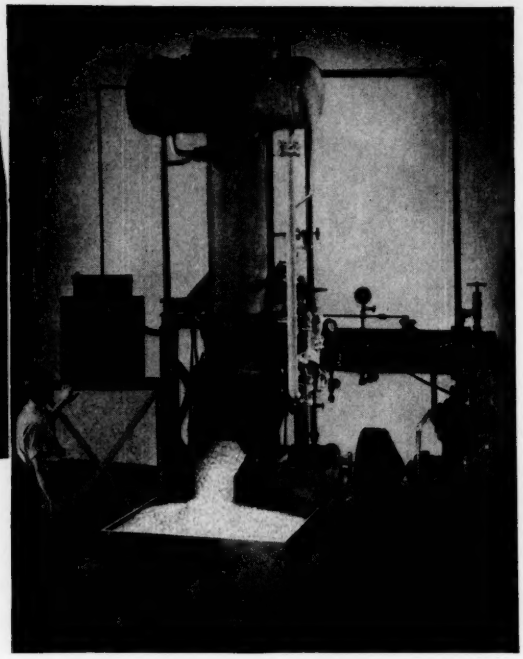


YESTERDAY: *A typical can-ice plant.*



TODAY: *A typical Vogtice plant. It occupies only 10% of the area required by a can-ice plant of equal capacity.*

Times have changed in ICE MAKING

MORE Ice from LESS Plant . . . that's the story of Vogtice* and the modern Tube-Ice Machine!

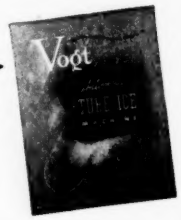
Employing direct expansion of the refrigerant, the *Automatic* Tube-Ice Machine eliminates brine tanks, brine circulators, ice cans, can fillers, dip tanks, dumpers, cranes, cubers and crushers, together with the power, labor and maintenance for such equipment, common to other systems.

Yes, times have changed Mr. Ice Manufacturer . . . and it's time now to modernize with Vogtice* and avoid the high cost production methods of yesterday.

**Vogtice, frozen inside tubes of small diameter, is a clear hard ice of superior quality. Either cylinder or crushed ice may be had from the same freezer by simple adjustment.*

WRITE FOR BULLETIN TI-3 ⟶

A complete description of the Vogt Automatic Tube-Ice Machine, the process and the product, Vogtice, will be found in this booklet, together with applications in varied fields of food production and distribution.



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In The Spotlight

MODIFIED AIR is being used experimentally in refrigerator cars to aid in keeping fruit in good condition during shipment. It is modified by cutting its normal 21 percent oxygen content to 5 percent or by adding carbon dioxide.

SEVERAL ice companies in Toronto are developing the use of the Milk Case Icer Bag with various dairies, and are thereby finding a new outlet for ice.

COLD STORAGE HOLDINGS for July 1 show an increase in both cooler space and freezer space over the holdings for June 1. For detailed reports see page 39.

FISHERY PRODUCTS for the balance of 1950, according to the Fish & Wildlife Service, will have a moderately active market with a generally firm price structure, but with keen competition between various edible fishery products. For detailed report see page 35.

AN EXPERIMENTAL ice factory using new design of freezing equipment has been set up in Haifa, Israel, to produce ice faster at lower cost. The process is described and illustrated in article on page 13.

ICE SALES in 1949 amounted to 41,342,458 tons according to a survey by the National Association of Ice Industries. This was 36½ percent more than reported ten years ago. For details of report see page 27.

THE OHIO ICE industry has the lowest ice industry compensation rate in the nation as a result of work by the Safety Committee of the Ohio Association of Ice Industries. For details see page 34.

COVER PICTURE: 500-ton refrigeration system in orange juice concentrate plant of Minute Maid Corp., Plymouth, Fla. The refrigeration equipment and concentrators remove 34,750 pounds of water per hour from the juice.

RESEARCH WORK at the California Agricultural Experiment Station, Davis, Calif., is discussed in the article starting on page 41. Aim of the work is to build up information on the effect of temperature, air composition and other variables upon storage life.

EVERY WORKING MAN labors approximately 47 days for the government, every skilled workman works approximately 67 days. Professional people and people in small businesses work as much as three or four months a year for the government. Some of our ablest citizens, the ones whose brains and energy largely provide prosperity and jobs for the rest of us, work sometimes as much as seven and eight months a year for the government.—N.A.R.W. Cold Facts.

EVAPORATING equipment for dissipating heat from water is a necessary adjunct of industrial processes using water. In the article on page 00 principles governing cooling tower operation are discussed

War or Not

KIPLINGER says . . . "no quotes." The second guessers say too much. With an almost exultant air, commentators add to the din and confusion until we switch them off and wisely wait for a less affected voice. Who knows about the future; we would drop everything and listen to him.

Will there be war? Wrong. There is war. It is not as big as the war in Spain in 1937, but this time we are in it. This is one big difference. Another difference is that we are worried about a great total war around the corner.

Will this war come—when? None of us knows, even Kaltenborn doesn't know. Stalin and his crowd don't know either. But they will prod here and push there. Their object is to make us more hysterical than we are.

Buy sugar, buy raw material, buy tires, buy to beat the price rise and the other fellow. It is just the good competitive spirit. But maybe it isn't. If you were sitting beyond the iron curtain and pulling strings over here, which ones would you pull. **Hysterical Buying,** to compete with military and normal purchases, **Inflate Prices,** get the money now and don't get caught, **Inflate Wages,** don't let them leave you out. These three strings would do the job if pulled with enough vigor to make the unwitting "party workers" do their stuff.

Hysteria, Selfishness, Boom and Bust—down that road is a great war. We can all predict that one; it will break out shortly after the depression starts.

What then is the course for the prudent man and the sincere American? He will keep his head and buy wisely for his family needs. If he operates a business his worries are greater but the same course will see him through. If he is a good manager, his plant is now in good productive condition and well and intelligently operated. He will keep it so. It is always the best plan to have a well-maintained plant which will make a good product in full volume at a reasonable cost. If darker days are ahead the principle becomes even more of a fundamental requirement.

The maintenance season will come shortly in refrigeration plants, look ahead to it and prepare for it.

Manpower is equally important. The future, whatever it brings, demands well trained, interested, effective men to keep all plants operating on a really productive basis. Why should any proportion of the industry manpower move out to other jobs in a crisis if they have been properly trained and their initiative utilized in the refrigeration industry?

There is more argument on this story but why is it needed? We expect to continue our improvement program. Increased emphasis will be placed on good plant construction and maintenance, intelligent operation and training of men in the industry. Whatever comes, these will always be basic and fundamental. This course has its values. We may run out of cigarettes or have no sugar for a few days but we won't spend much time in buyers lines. We will have no time to get hysterical and fly around carrying the ball for Uncle Joe.

...is one way to bigger profits

Expensive "muscle power" in an ice plant is a continuous drain on profits as well as a man's constitution. It needn't be. Because a G-W slat conveyor is a big labor saver... moves bagged and cake ice around the plant or to delivery platforms in less time and with fewer broken cakes. That adds up to lower over-head—more sales—bigger profits.

G-W conveyors are designed to carry block or processed ice in bags on straight, curved or right angle sections, from room to room or the outside platform. Unlimited flexibility assures an arrangement to fit perfectly your plant layout.

A Gifford-Wood engineer will be glad to visit your plant upon request. He is ready to apply 135 years of ice handling experience to any problem you may have without obligation. Call him in—let him show you the G-W way to bigger profits.

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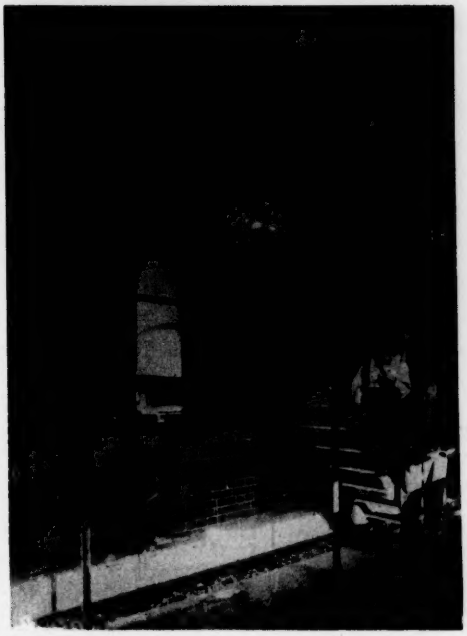


Fig. 1—One-mold experimental equipment for producing "Rapid Ice." This was the earlier form of the equipment. It will be seen that the frosted outer shell is round.

NEW RAPID ICE FREEZING SYSTEM

The desire to produce ice faster at lower cost is not confined to the United States. Some time ago the Haifa General Ice Factory and Cold Storage Co., Haifa, Isreal, set up an experimental ice factory in which a new design of ice freezing equipment was installed. The design has been refined and features have been added to make the freezing and discharging operations automatic.

The author and designer of the new ice freezing equipment is a mechanical engineer with long experience in the design, construction and operation of refrigeration equipment and plants.

By EUGEN WILBUSHEWICH

Experimental Station, Haifa General Ice Factory & Cold Storage Co., Haifa, Israel

THE widely used tank ice freezing process has been established by tradition and has remained the same through seventy years with only minor changes. In operation, the brine may be changed occasionally, the ice cans renewed, and steps may be taken to paint or protect against corrosion. There are standard tables for freezing time as well as numerous other data applying to the various phases of operation. Firms specializing in the supplying of parts have been formed and long operated. Some experts in ice production have expressed the opinion that there is little to discuss in regard to modernization or changes in standard can ice plants.

In ICE AND REFRIGERATION, October 1947 on page 19, John R. Watt of the University of Texas was author of an article "Producing Block Ice By Automatic Machine." He described his experiments with the newly adopted "incremental film" process. In this equipment the ice is formed from the inside to the outside in contrast to the tank ice which freezes from the outside to the inside. In the Watt machine, the ice is extruded without defrosting by means of an hydraulic ram.

The completion of this system with all details, so that it may be utilized in practice, would be welcomed. There is an important saving of space and weight of the whole plant. This changes the financial basis for the ice manufacturer with a view to amortization of the plant and the possibility is given to distribute cheaper ice. Ideal conditions are offered to the ice manufacturer for lowering labor costs.

Thawing Wastes Energy

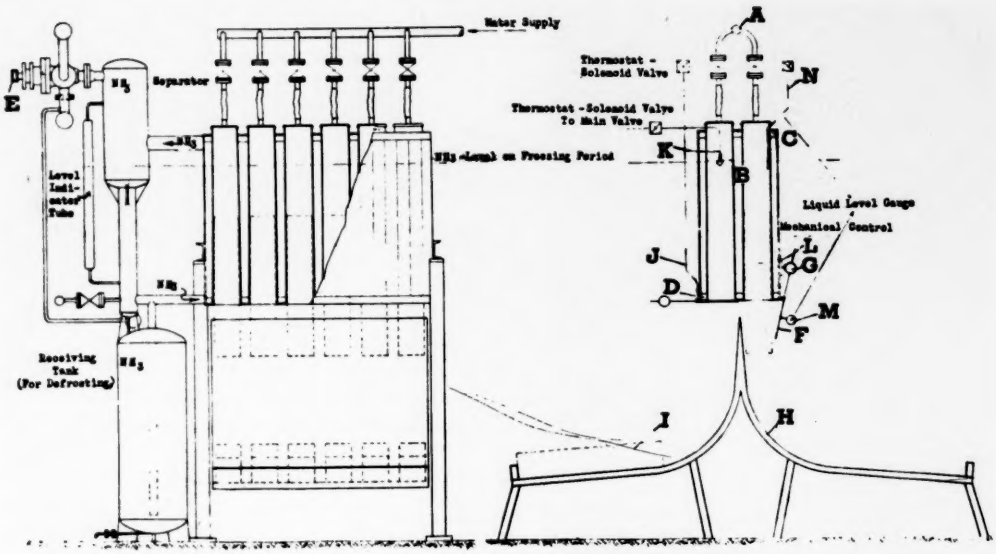
Also it can produce continuously without any unpleasant loss during the thawing process, as in the case of tank ice where a 55 lb. ice-block in Europe and the Orient loses about 5 percent. The American 300 lb. ice-block loses nearly 3 percent in thawing and this is a waste of energy.

As far as published data has shown, we can only speculate regarding the production of the larger rectangular section ice blocks with the incremental film machine. The round forms only have been described in the article about production of this ice.

Fifteen years ago, however, Dr. Huber made similar experiments with four-edged blocks and the German journal "Kæltetechnik," volume 1, 1949 reports about the tests and states that the experiments were stopped after the explosion of the apparatus. The reason for the explosion has remained undisclosed.

The idea I developed and then followed in experiments is to freeze ice and let it slide from the top downwards through its own weight instead of pushing the ice upward from below. In addition square edged blocks are produced to allow for better handling and transportation as contrasted with the round blocks.

The journal "Modern Refrigeration" in its April 1950 issue, page 90, reports on my experiments with the freezing of ice at different temperatures by direct expansion of ammonia. The freezing time was from two to five hours for the 7½ x 7½ inch ice blocks which are normal in Europe and the Orient, and have a length of 39 inches and a weight of 55 lbs. Where the direct expansion ammonia in my system is held at an



Construction diagram of a 12 mold "Rapid Ice" freezing unit. The various parts are as follows:

(a) Filling Pipe
(b) Refrigerating Medium in Evaporator
(c) To Suction
(d) From Receiver
(e) 4-Way Main Valve for Defrosting
(f) Lid which Freezes on with the Evaporation of the Refrigerating Medium and is the Packing at the Ice-Mold Bottom.
(g) Counter Weight
(h) Chute
(i) Ice Block
(j) Thermostat for Automatic Water Supply; at –5 C Water is let in.
(k) Thermostat Inside Conical Cavity Formed by the Ice-Block. At about –1 C the Main Valve E is put into Action for Defrosting with Warm Gas.
(l) Mechanical Control for J and K
(m) Water Gauge
(n) Electrical Water Control

evaporating temperature of –7 F (minus 22 C), the freezing time is about two and a half hours. This increases to about five hours if the evaporating temperature of the ammonia is raised to 12 F (minus 11 C). The freezing time is so much shorter than that of ice blocks in the large standard cans that we called it "Rapid Ice."

Original Plant

The original experimental plant for freezing "Rapid Ice" consisted of one ice mold surrounded by a housing to accommodate the direct expansion ammonia. This equipment is shown in Fig. 1. In the course of years, the ice-freezing equipment has been altered many times in order to evaluate different ideas. Various methods of ammonia feed were tried and in one case, the liquid was injected from two sides. Some types of construction give a more rapid freezing time but construction was expensive.

A multiple mold freezing unit is now under construction. This new equipment will have 12 freezing chambers or molds which are shown in Figures 2 and 3. In dimensions the ice blocks will be small and square in section as described above.

The new equipment utilized two laws of nature to permit automatic operation (a) two wet plates of iron sheeting freeze together in a few seconds at low temperature and it is difficult to separate them without defrosting; (b) the water when changing into ice increases its volume by about 9 to 10 percent and during ice block formation, the ice has a tendency to form a conical funnel which freezes at the very last. It is here that anything contained in the water is concentrated. A counterweighted lid which freezes fast to the bottom of the mold has been designed for the new equipment. This holds the water in the mold until it is frozen and is illustrated in Figures 4 and 5. The addition of this hinged door, along with the use of the thermostats and solenoid valves, permits the freezing of ice automatically and requires no labor for removing the ice blocks. The complete automatic freezing plant with one mold is shown in figure 5.

The well-known refrigeration expert and engineer, Walther Pohlmann, has been interested in the development of my system. Formerly he was editor of the journal, "Die Kaelte Industrie." He has followed our many experiments and has offered much encouragement. A switching scheme he suggested his proven most suitable for controlling the freezing of several batteries and defrosting them at the proper time without disturbing the freezing process in the others. The method which we call the "Pohlmann Switching Scheme" allows one compressor to operate on several batteries and in practice this proves very valuable for the larger plant.

Can Make Larger American Ice Blocks

The large 300 lb. American ice blocks can easily be made in this system. In fact we have already designed a battery of molds of this type. It can be fabricated by welding iron sheeting with strengthened seams and possibly can also be cast from suitable material.

The future will show whether the "Rapid Ice" produced in this equip-

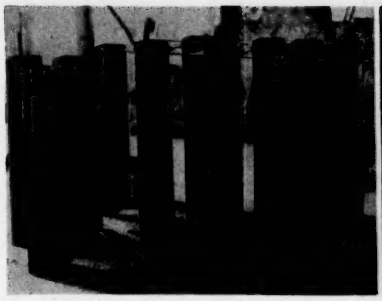


Fig. 2—Construction photo of a battery of 12 ice molds being fabricated. The square, ice freezing molds and the top and bottom plate assembly are visible. The ammonia boils in direct contact with the outer surface of the molds. Fig. 3—The welder is completing the application of the outer shell to the group of ice molds.

ment will be more satisfying to the ice user and to the ice manufacturer. Perhaps it will appeal to the latter by simplifying ice production and reducing the cost of ice. It certainly appears that this type of plant would be lower in first cost since it eliminates the conventional freezing tank with its costly equipment and the continuous danger of corrosion. There would be no large number of ice cans or thawing tank and dump. The space required for the ice plant would be considerably reduced and the cost of land, plant, equipment, and operation should be much lower. Thus it appears that the cost of ice production would be decreased if the method and equipment described are utilized.

The speed of freezing of "Rapid Ice" is surprising. Freezing time for the square blocks having a 7½ x 7½ inch cross section is shown in the table. The ammonia temperature is measured in the evaporating space around the ice mold.

FREEZING TIME—7½ x 7½ IN. BLOCKS

Ammonia Evaporator Temperature		Freezing Time
Fahr.	Celsius	Hours
10 to 16	−9 to −12	5
5 to 10	−12 to −15	4¼
0	−18	3½
−4	−20	3
−7	−22	2½
−13 to −16	−25 to −27	2
−40	−40	1½

Also surprising is the defrosting time of about three minutes and experience has shown that when a block is thawed loose from the mold, the meltage is about ½ to 1 percent. The latter depends on the construction of the mold. Smooth, straight walls result in a lower figure.

Power Consumption

The power consumption depends on the evaporation temperature. The lower the temperature of evaporator, the larger the compressor required. It should be remembered that the purchase of the compressor is only a fraction of a standard ice plant. The principal costs are found in the tank system. The practical ice manufacturer does not give much attention to theoretical calculation for power consumption in respect to new construction.

With regard to "Rapid Ice" I do not wish to present in this article any data on power consumption. The first ten ton plant will soon be placed in operation and it will operate next to a ten ton tank ice plant. Thus I shall later publish the exact figures taken from experience gained after some months operation.

Fruit Juice Freezing

Besides the production of ice, the quick-freezing system in blocks has the advantage that it may be used for the freezing of different fruit juices and fruit puree. For example—fresh red ripe tomatoes were passed through a meat grinding machine and the tomato puree was frozen inside the 55 lb. ice block ice mold at −22 F (−30 C) within two and a half hours. After nine months' storage in a cold storage room, at an average temperature of 25 F (about −4 C), tomato soup was cooked from the block, and it was consumed with pleasure. The product lost neither aroma, taste nor color.

130 Uses for Ice

USE of ice from domestic refrigeration to treatment of carbuncles is included in a list of 130 subjects published in the "Iceogram" house organ of the Richmond Ice Co., Richmond, Kentucky. The list covering the many uses of manufactured ice was used in judging a contest held among students of county and city high schools.

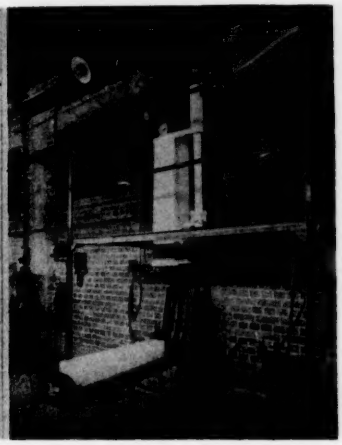


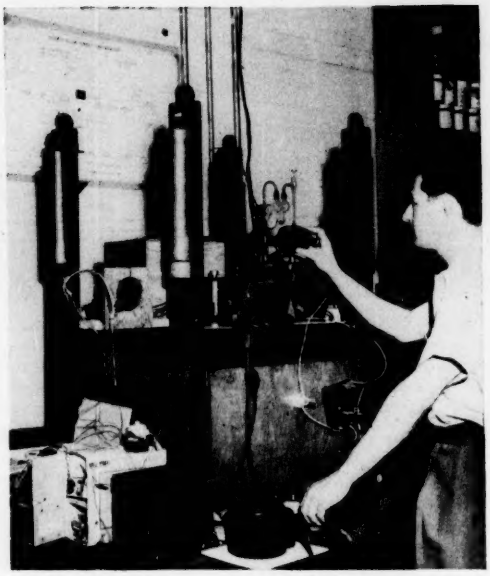
Fig. 4—The experimental plant of later design is equipped for automatic operation. The discharge door at the bottom is held in place by a counter-weight and freezes shut when a new cycle begins.

Fig. 5—A general view of the automatic ice freezing unit shows details including the discharge chute. This is the final form of the experimental ice freezing plant.

EXPAND RESEARCH Facilities for Study of Perishables

The Research work on refrigeration of fruits and vegetables now being carried on at the California Agricultural Experiment Station are listed and summarized in this report.

F. W. ALLEN
Pomologist, California Agricultural Experiment Station



Humidity test apparatus developed and built in the Mechanical Instruments Laboratory of the National Bureau of Standards.

HANDLING and storage work of fruits in the University of California, Agricultural Experiment Station, Davis, had its inception about 1914 when Professor A. V. Stubenrauch was recalled from the United States Department of Agriculture to head the Division of Pomology. Such work has been continuous since that time with the exception of about two years between Professor Stubenrauch's death in 1917 and the appointment of Professor E. L. Overholser in 1919.

All of the earlier work was with fruit. Only recently since the appointment of Drs. L. L. Morris and H. K. Pratt in Truck Crops, have vegetables been included. Within the past few years only has any attention been given to meats, fish and poultry products. The over-all program, however, in all lines is expanding and since the earliest work of Stubenrauch, Overholser and Cruess some thirty years and more ago, a dozen full time staff members and an equal number of assistants are now engaged in work involving refrigeration.

Even a larger and more extended research program is anticipated as new and more adequate facilities are provided. Food Technology plans to start their new building with modern equipment on the Davis campus this year. Poultry is likewise to have new facilities, including a number of refrigerated rooms, and I am most happy to report that at long last the efforts to secure suitable experimental cold storage facilities at Davis with a wide range of temperatures and humidity controlled rooms for both fruits and vegetable work is about to be realized.

To describe the lines of investigation now being carried on, some of the related lines of work are grouped under general headings. Some of the more basic studies are the following:

Respiration

Fresh fruits and vegetables, both before and after harvest, and even in storage at 32 F, are continuously absorbing oxygen and giving off carbon dioxide. This rate of gaseous exchange — markedly influenced by temperature and the surrounding atmosphere—has long been considered an index to vital activity and quality changes. Respiration studies, therefore, are not only of great importance in estimating heat development in transit and in storage, but to a more complete understanding of the biological changes during ripening (in fruits) and in subsequent deterioration.

Dr. Biale at Los Angeles has secured respiration data on lemons and avocados and with the development of the colorimetric method for rapid respiration determination, by Drs. Claypool and Keefer, extensive respiration data have been secured at Davis on different deciduous fruits and vegetables.

The aim of all this work is to build up a background of knowledge which will make possible a better evaluation of temperature, air composition and other variables upon storage life. Respiration data have long been considered of practical importance in relation to the rate of ripening at different temperatures. More recently it is helpful in answering the question "what is the effect of one fruit upon another in storage?" Dr. Biale is at present making final checks on a new oxygen analyzer and recorder of the Beckman Co. which promises to be able to determine more accurately than by any previous methods, respiration of products stored in a carbon dioxide atmosphere.

Biochemical Studies

A second very fundamental type of investigation which has far reaching applications, both as to quality and storage life, is that of biochemical studies. Under this broad heading would come—

Summary of report presented at annual convention of Pacific States Cold Storage Warehousemen's Association.

(a) The work of Dr. Joslyn working upon enzymes as related to quality deterioration, also the influence of temperature upon the color, flavor and nutritive value of processed foods—including dried and dehydrated fruits, canned peaches and citrus juices. His work under this heading also includes a study of the quality of wines and that in fish and meat products.

(b) That of Dr. Bouthilet in his study of flavor components, flavor and quality changes in poultry in relation to temperature and other factors. Also that of Dr. F. W. Lorenz on phosphoric acid and moisture changes in stored eggs, and the effects of washing upon egg souring. These latter microbiological studies are being conducted in cooperation with commercial handling plants and with the Crystal Ice Co. of Sacramento. Work has already been published on the efficiency of various processing oils applied to eggs prior to storage.

(c) The proposed work of Dr. Floyd Carroll of the Animal Husbandry Division on a study of meat deterioration under mechanical and under ice refrigeration. Some of this work is planned in cooperation with the Union Ice Co.

(d) Laboratory studies and commercial tests to detemine the rate and nature of changes in sweetness, toughness and flavor, before and after harvest, of broccoli, sweet corn and potatoes.

(e) The isolation, identification and measurement of volatile emanations from fruits and vegetables. A mixture of fruits and vegetables and in some instances even a mixture of different fruits or of different vegetables have proven definitely harmful upon storage life or flavor. Dr. Biale at Los Angeles, together with Dr. Pratt of Truck Crops, are about ready to publish some of their results on a micro-method for determining ethylene effects. Dr. Biale has already shown the effect of green mold in hastening ripening and hopes to determine if ethylene is produced by other fungi and also by citrus fruits. With the appointment of a chemist technician in Pomology, Dr. Claypool and I hope to make similar determinations with deciduous fruits.

Atmospheric Studies

Atmospheric studies include those of air purification and those in which products are held in various atmospheres of different oxygen and carbon dioxide levels. Preliminary trials and some observations have been made on deciduous fruits where it was attempted to remove the active volatiles by means of activated charcoal filters. All results have been inconclusive and now that it has been pretty definitely shown that ethylene is not removed by charcoal, further attempts along this line have been delayed pending the results of the chemical tests referred to above.

The possibilities of using carbon dioxide atmospheres as a supplement to refrigeration to retard coloring, softening and mold growth on different deciduous fruits and lemons have been shown by a number of publications. Holding and observing fruits in "air" of various carbon dioxide and oxygen levels is being continued and similar work on vegetables has been started. Atmospheres containing 5 to 10 percent of carbon dioxide and only 1 or 2 percent of oxygen reduce the rate of vital activities and have the possibility of doubling the normal storage life of Yellow Newtown and Gravenstein apples and of Bartlett pears—and of materially extending it with some other fruits.

The results are particularly marked where it is necessary or desirable to hold the fruit at relatively high storage or transit temperatures. As yet "gas" storage, so called, has not been accepted in the United States as it has in England and South Africa, but the use of dry ice as a supplement to water ice refrigeration, in the transcontinental shipment of cherries to eastern markets has been adopted as standard practice.

Basic research studies now being made on fruits and vegetables at California Agricultural Experiment Station:

- Respiration
- Biochemical Work
- Atmospheric Control
- Temperature Influences
- Humidity Conditions
- Cold Storage Life
- Maturity and Precooling
- Quality in Stored Products
- Food Freezing
- Oriental Fruit Fly

Temperature Influences

It has long been known that bananas fail to ripen if held below 50 F and that Yellow Newtown apples grown in the Pajaro Valley are subject to an internal browning of the flesh when stored at a temperature below 36-38 F. Subsequent tests with plums and peaches have shown that some varieties at least of these fruits may develop brown flesh and fail to ripen normally when stored at intermediate temperatures between 35 and 40 F. It seems certain that an abnormal type of metabolism occurs within this temperature range but the explanation for it is still to be found.

Certain warm season vegetables, including summer squash, cucumbers, egg plant, cantaloupes and other melons, and tomatoes are also adversely affected by temperatures below 50 F. These harmful effects are exemplified by rapid decay and deterioration upon removal from storage and by surface pitting, internal discoloration and failure to complete normal ripening. This work on the chilling injury of vegetables has been carried on by Drs. Morris and Mann as a Refrigeration Research Foundation project .

Humidity Studies

No definite humidity studies have been conducted for a number of years but doubtless some of you recall the work of previous years by W. T. Pentzer and myself on moisture loss from apples, pears and grapes when stored in air of different relative humidities. The results of those tests indicated that these fruits lost moisture in any atmosphere below saturation but as a compromise between no moisture loss and a greater susceptibility to the attacks of mold, humidities of between 85 and 90 percent were recommended for commercial holding.

General Studies on Cold Storage Life

The more general problems of immediate commercial interest include those previously made to determine the normal storage life of stone fruits, those made recently on ripening and storage of Bartlett pears from trees sprayed with naphthalene acetic acid to prevent pre-harvest drop, and those of the past year to determine the possibility of extending by means of cold storage the shipping, and more particularly, the processing period of the Gravenstein apple. Apples from different orchards and those of different maturity showed marked differences in storage quality, but in general most lots were successfully held for two to three months with little loss in quality.

Commercial scale cold storage studies are now in progress with onions and sweet potatoes and significant improvements have been intro-

duced in commercial storage practice of the latter.

Because of an over-supply of table grapes, the desire to avoid picking holidays (in the case of the Tokay) and the desire to extend the marketing season as well as to exploit more fully the good qualities of various varieties—such as Thompson Seedless and Tokay, the entire grape industry is becoming cold storage conscious.

Despite the fact that commercial cold storage practice for grapes has been perfected to a high degree (Temperature 31-32 F, humidity 85 to 90 percent and sulphur dioxide .2 percent for 30 minutes each seven to ten days) and that grapes are now held beyond March 1, Dr. Winkler finds considerable variation in the keeping quality of the same variety from the same region.

This is believed due to the conditions under which the fruit is grown and how it is handled. The Division of Viticulture, therefore, is now investigating on a commercial scale, these influencing factors, and from this study hope to determine something of the keeping quality of the fruit from various vineyards at time of harvest.

Maturity and Precooling

Among the factors influencing either transit or storage life of fruits, none are of more importance than those of harvesting at proper maturity and of prompt cooling. Maturity and precooling investigations were two of the lines of work which were begun twenty years and more ago and in certain aspects have been continued ever since.

The work on maturity standards has been and still is in cooperation with the State Department of Agriculture, while that related to storage and shipping quality has been in cooperation with shipping and storage companies and with the United States Department of Agriculture. At the time the precooling studies were begun scarcely any of the deciduous fruits were cooled prior to shipment.

Now, of course, most of the more perishable fruits (and vegetables likewise) are precooled. Cannery men are also more fully recognizing the advantage of precooling their cannery stock. I feel that the University may claim a certain part of the credit for the advancement of precooling although the greatest impetus came from you as ice and as storage men and from the manufacturers of precooling equipment.

Although the first aim in storage tests is to ascertain keeping quality, the ultimate aim is to maintain eating quality. Some of these quality studies have been mentioned under biochemical tests — others include organoleptic tests on the canning quality of stored peaches, pears and apples. Quality or flavor in either fruits or vegetables is one difficult of determination or measurement and much chemical work will be involved in the study.

Preservation by Freezing

Investigations on the preservation by freezing have been conducted by Joslyn since 1926 and were started even earlier by Cruess and Overholser. Early work dealt entirely with fruits and vegetables but at present fish and meats are also included. In the work on fruits and vegetables the Divisions of Pomology and Truck Crops are cooperating in a breeding program to devolop varieties best suited for freezing purposes. As a part of the freezing program the Division of Food Technology has cooperated with locker plant operators and patrons.

Oriental Fruit Fly Treatments

Should the Oriental fruit fly, now present in the Hawaiian Islands, once become estabilshed in California, untold damage would result to the fruit, vegetable and flower industries. Entomologists working in the islands have devised certain fumigation, vapor heat and low temperature treatments for fruit fly control but the immediate question is what will be the effects of such treatments upon our fruit, flowers or vegetables? The answer can only be determined by trial, hence this very urgent and important work in ascertaining toxicity and critical limits for a wide range of products is now being carried on by the Divisions of Pomology and Truck Crops at Davis and by those in Plant Physiology at Riverside.

Although other problems might be mentioned in which refrigeration plays a major role or a considerable part, perhaps these will suffice to indicate something of the University's activity. Unfortunately perhaps the results of these investigations do not always get the immediate publicity or distribution they deserve but I am sure the different individuals working on these problems, and to whom I am indebted for some of the information, will always be glad to advise of the progress being made on any project in which the reader may be interested.

Transport of Perishables Discussed by USDA

AT A meeting held in Washington, June 8 and 9 the Transportation Advisory Committee, operating under authority of the Research and Marketing Act, discussed with U. S. Department of Agriculture representatives problems involved in the transportation of agricultural products and submitted recommendations which are intended to help solve such problems.

Improved refrigerator cars is the objective of research by the Production and Marketing Administration in which mechanically refrigerated and heated railroad cars have been tested for transporting perishable products. Experiments so far strongly indicate the possibility of reducing refrigerating and heating costs and increasing the efficiency and dependability of the equipment. The Committee commended the progress of this work and recommended that efforts also be made to develop lighter weight bodies and refrigerating units for trucks.

In an effort to standardize and develop improved packing methods and containers for fresh fruits and vegetables, the PMA has conducted studies on lettuce, celery, peaches, beef, eggs, watermelons, cantaloupes, citrus, and carrots. Preliminary results indicate that improvements can be made in this field and plans are to extend this work to other commodities next year.

Melon Shipping Damage Curbed by New Crate

REDUCTION in damage claims in the shipment of iced cantaloupes from the West is seen in the adoption of a new shipping container which will also increase loading capacity of cars.

During the 1949 season extensive experiments were conducted by the Freight Loading and Container Section of the Association of American Railroads in cooperation with Western Growers' Association and a box institute.

The new containers are made with wider slats than the old type and are one-quarter of an inch less in length.

With the new containers, which contain the very same number of cantaloupes as the old crates, another row can be placed where the bracing used to be. This extra row permits the loading of 17 cars of cantaloupes into 16 cars, thereby resulting in the savings of standard refrigeration charges on every 17th car.

Mechanical Draft Cooling Towers

Principles governing cooling tower operations followed by analysis of basic design factors. The objective—todetermine which tower does mosl for least cost.

DR. N. W. SNYDER, Technical Adviser
W. W. PERKINS, Research Engineer
Santa Fe Tank & Tower Company

THE cooling tower (water cooling tower, as designated in the Engineering Index) is an engineered piece of equipment used for dissipating the heat from water through the use of the latent heat of evaporation and sensible heat transfer when the water is in direct contact with air. It is used in oil refineries, refrigeration and air conditioning systems, power plants, or other industries. The cooling tower establishes the atmosphere as a heat sink (the temperature of which is the wet bulb), for the various thermodynamic cycles.

An example is the refrigeration cycle which is made possible by dissipating the heat of compressed vapor (say Freon-12) in a condensor cooled by the water from a cooling tower. Another is that the condensation of the overhead in a distillation tower usually depends upon water cooled by a cooling tower, in fact it may be best to initiate design of such a tower by determining the pressure and temperatures of the vapors off the top plate as it is effected by the cooling water temperature available.

Cooling loads in general may be maintained by the following:

(1) Water cooling towers
(2) Finned tube air coolers
(3) Natural water (well, river, lake or ocean water).
(4) Refrigeration

Each of these have a definite use, depending upon the problem at hand. No. 2 shall be elaborated upon in a paper separate from this series.

As our civilization becomes more industrialized, the need for additional water in the manufacturing processes becomes paramount. The diversion of water from our lakes and streams, together with the lowering of the water tables has created a water shortage that is alarming in most industrial regions. The resultant high cost of water has not only increased the use of cooling towers, but has created intense interest in improving designs, to obtain the most in cooling, with a minimum expenditure of water.

Because of the high cost of materials, maintenance and power, a more careful design of the cooling tower is required in order to properly balance the size of the tower for a particular cooling problem. As an aid to the executive, as well as the technical, or process engineer, in choosing an economical mechanical draft cooling tower, this paper discusses a number of the fundamentals of tower design and the effect of certain features on operating characteristics.

Principles of Evaporative Cooling

Sensible Heat and Latent Heat: Transfer of heat from water to an adjacent stream of air is partly maintained by the evaporation of water into the air and partly by the difference in temperatures between the water and air. Heat lost by evaporation is named "Latent Heat" and heat loss by temperature difference, "Sensible Heat". Latent heat transfer always occurs from the water toward air, but sensible heat transfer may be toward or away from the water (See Fig. 2). The energy of evaporation is supplied only by the water surface and is the latent heat of evaporation at the water surface temperature.

Evaporation occurs when the air immediately adjacent to the water surface (saturated at the temperature of the water surface) possesses a larger absolute humidity than the fresh air passing by. Absolute humidity is given as pounds of water vapor per pound of dry air. Microscopically speaking, the number of molecules of water vapor per lb. of dry air, next to the water surface, is greater than that for the air far away; therefore, there is a net migration of these molecules away from the water. It has been shown scientifically that the difference in absolute humidity causes evaporation in the same way that temperature difference causes heat flow. Evaporation rates can be written as follows:

$$e = h_d A(H_o - H_{oo}) \quad (1)$$

Where, e = evaporation rate of water, lb per hr.
h_d = mass transfer coefficient, (Evaporation rate coefficient) in pounds/hr/sq. ft./lb. water vapor/lb. dry air.
A = surface area of transfer, sq. ft.
H_o = absolute humidity of air saturated at the temperature of the water surface, lb. water vapor/lb. dry air.
H_{oo} = absolute humidity of the main body of air, lb. water vapor/lb. dry air.

It is seen that equation (1) is similar to the basic heat transfer equation,

$$q_c = h_c A(T - t) \quad (2)$$

Where q = heat transfer rate, Btu/hr.
h_c = heat transfer coefficient, Btu/sq. ft./hr./°F.
A = Surface area of heat transfer, sq. ft.
T = Surface temperature of water, °F.
t = temperature of air (dry bulb), °F.

Equation 1 is similarly written for mass transfer processes other than evaporation, such as, absorption, distillation, extraction and dehumidification.

A decrease in water temperature will accompany evaporation, because the energy of evaporation (latent heat) must be supplied by the water surface. As an example, a simple heat balance will be made on a given amount of water from which 1 percent has been evaporated, with an accompanying decrease in temperature.

$$W C_{pw} (\Delta T) = W X \lambda \quad (3)$$

Where W = a given weight of water, lb.

ΔT = change in water temperature, °F.

C_{pw} = specific heat of water at constant pressure Btu/lb./°F.

X = fraction of water evaporated.

λ = latent heat of evaporation Btu/lb.

For water $C_p = 1$, $X = 0.01$ and $\lambda = 1037.2$ at 100 F.

$$\Delta T = \frac{(0.01)\ (1037.2)}{1} = 10.37°F$$

or approximately 10 F for each one percent evaporated.

Factors in Determining the Date of Heat Transfer

It now remains to determine at what rate or how quickly heat will be transferred from the water surface to air. This rate of heat transfer which includes the latent as well as the sensible heat transfer, is incorporated into the two coefficients of heat transfer h_d and h_c

respectively, as well as the surface area and the differences in absolute humidity and temperature shown in equations (1) and (2). Factors which primarily effect the mass transfer coefficient and the heat transfer coefficient are given as:—

(1) Conditions of air flow.
(2) Conditions of water flow.
(3) Shapes of the surfaces of transfer.
(4) Physical properties such as the air viscosity, heat capacity, thermal conductivity and the water conductivity, heat capacity and surface tension.

Conditions of Flow of Air Over Water Surface

First, we shall discuss the conditions of flow of air over the water surface which results in three distinct conditions, each effecting the heat or mass transfer.

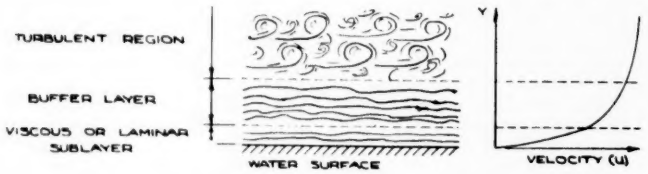


Fig. 1—Characteristics of air flow over water surface.

As shown in Fig. 1, the air near the surface moves at such a low velocity that it flows viscously and is named the "viscous" or "laminar sub-layer." The interesting and highly important characteristic of this layer is that the air particles flow in parallel planes without intermixing. At the boundary between the water surface and air, the velocity of the air is zero with respect to the water surface. At a point close to the surface, the air is moving slowly and in true streamlined viscous form. At distances further removed from the surface the velocity increases until the buffer layer is reached. Air flowing in the buffer layer is partly viscous and partly turbulent and is therefore in a transition region. At still further distances from the surface a turbulent region is encountered. Here, particles of air are moving at such high velocities that viscous forces are small compared to the inertia forces. These particles move in a highly agitated state with little damping from the viscous propertly of the air.

The heat transfer must be considered in the light of these conditions of air flow as found in the three regions described. For the laminar layer which is almost stagnant, heat must flow by pure conduction. With air being a poor conductor of heat (note that air is the principal insulator in the materials such as cork board or glass wool) the thickness of the laminar boundary layer becomes the foremost factor as it effects the rate of heat transfer. Increasing the average velocity of the main body of air reduces the thickness of this layer (or "film") thus accomplishing an increased rate of heat transfer. The opposite occurs for a decrease in velocity of air.

In the turbulent region, heat transfer is greatly enhanced for the reason that large particles of air which are close to the heated surface, (just outside the buffer layer), gain heat and transport it by moving a relatively large distance into the region of colder fluid. Higher air velocities cause a more intense turbulence, as well as a thinner viscous layer, resulting in an increased heat transfer rate.

With the previous discussion in mind, the viscosity, conductivity and specific heat of air play an important role as they effect heat transfer rates. These physical properties are particularly a function of temperature with pressure having a negligible effect. Different configurations of flow occur for various heat transfer surfaces (drops, films on packing slats) and result in different degrees of viscous layer thickness and turbulence.

Evaporation or mass transfer is effected by the conditions of air flow in the same manner as for heat transfer. Diffusion of water vapor through the viscous layer depends upon a so-called diffusivity which is analogous to the thermal conductivity. The transport of water vapor, by turbulence, is for all practical purposes the same as for the transport of heat; that is, a particle which is moving cross-wise to the stream bodily, carries the property of humidity as well as temperature.

Friction to flow of air, or pressure drop, with respect to a whole piece of equipment, is related to both the sensible heat transfer and evaporation rate. When air rates are increased in the cooling tower, both the pressure drop and the heat transfer increase in a direct relation. This will be shown in a later paper.

An analogy between the sensible and latent heat transfer was first shown by W. K. Lewis through an equation relating the heat transfer and mass transfer coefficient for a water-air system. It was the approximate expression:

$$\frac{h_c}{C_p\ h_d} = 1 \qquad (4)$$

C_p = Specific heat of moist air, Btu/lb/° F.

Lewis used this equation to show that the wet bulb line on the psychrometric chart was the same as the constant enthalpy line. With the specific heat of moist air equal to 0.25, equation 4 reduces to a simple formula:

$$h_d = 4\ h_c \qquad (5)$$

This analogy between the mass transfer coefficient and the heat transfer coefficient for the water-air system corroborates with the discussion just given concerning the similar effects of air flow conditions on either the mass transfer or heat transfer or heat transfer rate.

It would be interesting to note the significance of the latent heat transfer as compared to the sensible heat transfer rate, for a particular example of the water-air system. With air, at 80 F dry bulb, and 60 F wet bulb, passing over water at 100 F., and for a value of the heat transfer coefficient equal to 25 Btu/sq ft/hr/

* F equation (5) yields:

$h_D = (4)\ (25) = 100$ lb/sq ft/hr/lb w.v./lb d.a.

and $H_o = 0.0432$ lb w.v./lb d.a.

$H_{oo} = 0.0064$ lb w.v./lb d.a.

$\lambda = 1037$ Btu/lb. at 100 F

From equation (1) the evaporation rate is,

$$\frac{e}{A} - = (100)\ (0.0432 - 0.0064) =$$

3.68 lb/hr/sq ft

From equation (2) the sensible heat transfer is:

$$\frac{q_c}{A} - = 25\ (100\text{-}80) = 500 \text{ Btu/sq ft/hr.}$$

The total heat transfer rate per unit area is then computed by:

$$\frac{q}{A} - \frac{q_c}{A} + e\lambda \qquad (6)$$

or $q/A = 500 + (3.68)\ (1037)$

$= 500 + 3810 = 4310$ Btu/sq ft/hr

Of the total heat transfer, 88.3 percent results from evaporative cooling for this particular problem. For other water temperatures and the same air conditions and transfer coefficients, figure (2) shows the relation between latent and sensible heat loss per unit area of transfer surface.

It will be noted in Fig. 2 that the latent heat transfer increases much more rapidly than the sensible heat transfer for increasing water temperatures for the same conditions of air. At a water temperature of 140 F. the latent heat transfer is 11.9 times the sensible heat transfer showing the enormous advantage of evaporative cooling.

Wet Bulb Temperatures

A further examination of Fig. 2 will show that as the temperature of the water approaches the so-called wet bulb temperature of the air, the rate of heat loss by evaporation remains positive while the rate of sensible heat loss grows more negative. At the wet bulb temperature of 60 F., the sensible heat transfer is equal to the latent heat transfer rate, therefore an equilibrium condition exists. At this point the net heat transfer, or total heat transfer rate is zero and the water can no longer decrease in temperature. Thusly is the wet bulb temperature defined.

Further explained: When water is at the wet bulb temperature, the air temperature, or dry bulb temperature, is either equal to the water temperature, or greater than the water temperature. Correspondingly, the sensible heat transfer is either zero or negative. On the other hand, air saturated at the wet bulb temperature and being next to the water surface, will have a humidity greater than, or equal to, the air farther away. In this case the evaporation rate will be positive, causing a positive latent heat transfer rate. When the latent heat transfer rate is positive and equal in number to the negative value of the sensible heat transfer rate. then the water temperature is named the "wet bulb" temperature.

Cooling tower theory and practice establishes the wet bulb temperature of the incoming air as the limiting temperature when cooling water in direct contact with air. This temperature can only be approached, and is never attained in the usual method of contacting air and water.

Modern cooling tower design requires an approach to the wet bulb which is economically feasible with respect to the tower, fan and pump size. Upon inspection of the dotted line in Fig 2 for instance, lower heat transfer rates per unit area occur for closer approaches to the wet bulb. This means that higher surface areas are required for the same amount of heat dissipation when approaching the wet bulb temperature thus resulting in a larger tower. On the other hand, keeping the tower size constant, the heat transfer rate may be increased by increasing the mass transfer and heat transfer coefficients, this being accomplished by increasing the liquid and air rate per unit cross sectional area.

Important Considerations in Cooling Tower Design

The water cooling tower requires a means of causing intimate contact between water and air. There are a variety of combinations from the

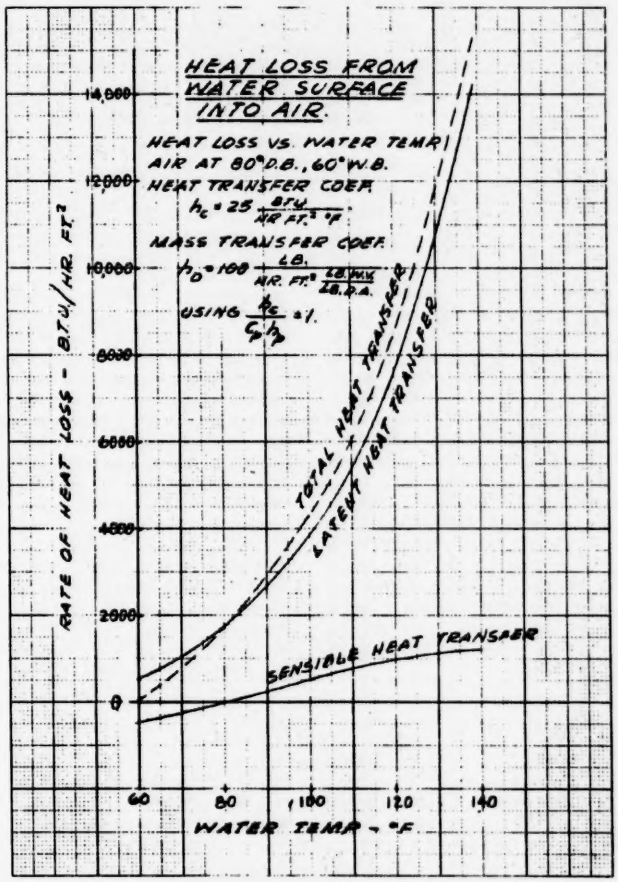


Fig. 2—Relationship of latent and sensible heat transfer at fixed air condition.

enumeration given as follows, and shown in the designated figures relating to Mechanical Draft Cooling Towers.

Relative Flow of Water and Air

a. Counter Flow: Air and water are lead into the counter flow tower (3a) in such a way as to contact each other while flowing in opposite directions. This method requires a smaller cooling tower, with respect to total volume. Counter flow yields the best means of transfering heat, as compared to cross flow and parallel flow, because the mean temperature and humidity differences are greater. Depending on the problems, both the air and water rate may be varied over a wide range.

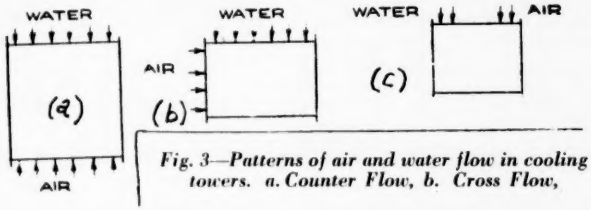


Fig. 3—Patterns of air and water flow in cooling towers. a. Counter Flow, b. Cross Flow,

b. Cross Flow: An attempt is made in commercial practice to contact the air and water flowing at right angles with respect to each other; the water falling verticaly and the air being pumped horizontally, (3b). Although it may be a simple matter to distribute the water evenly over the tower, the air may not be distributed properly, depending upon the method of placing the fans, and other design features.

c. Parallel Flow: For this case, the air and water contact each other while flowing in the same direction. This would necessarily mean vertically downward since it is easiest to get the water to flow downward by gravitational means. This method is highly undesirable for the reason that the hot moist air leaves the tower at the bottom and may circulate up to the inlet and repass through the tower effecting a lower performance.

Pumping of Air

Induced Draft: By placing the fans at the air exhaust end of the tower (usually at the top of the tower), as shown in Fig. 4a, the exhaust air leaves with a high velocity from the exit nozzle to carry it far enough away so that natural wind currents do not return it to the air intake. Further, in cold weather the moving parts are continually subjected to warm air, thus preventing icing of these parts. With air being exhausted directly into the atmosphere, a propeller fan becomes most economical because the operating conditions require large quantities of air to be pumped at low pressure drops. The characteristics of the propeller fan are such as to satisfy this condition. For the case where the air is to be exhausted into long exit ducts or where the air is brought into the tower by means of long entrance ducts, the higher pressure drops may require a centrifugal type fan.

Generally, air may be introduced through large inlet areas resulting in lower velocities, and therefore can be guided into the tower more uniformly with negligible pressure loss.

Forced Draft: As shown in Fig. 4b, the fan is placed on the air inlet end of the tower. This arrangement causes a poor distribution of air within the tower, with the air being required to turn at right angles and move upward as it enters at high velocity. The air would not be distributed as evenly as for the induced draft vertical tower shown in Fig. 4a where the air is directed into the tower over a much wider area and at at a lower velocity. Upon entering the tower the air must necessarily lose some of its velocity while passing through the tower. This results in a shock loss or pressure drop.

Upon leaving the tower at the top, an additional velocity may be imparted to the air by constructing a nozzle in order for the moist air to be pumped away from the tower but, in comparison with the induced draft type of tower, there is an additional velocity head which must be added to the pressure drop. If this velocity at the exit is not developed then much of the moist air may recirculate to the entrance. Again, the means of pumping the air may be with a propeller or a centrifugal fan, depending upon the pressure drop required, and volume of air to be pumped.

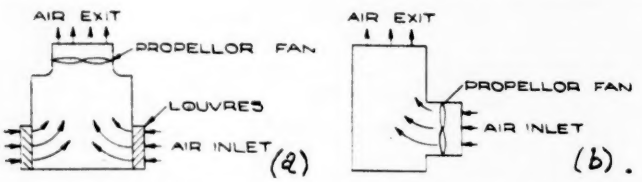


Fig. 4—Methods of pumping air through towers. a. Induced Draft, b. Forced Draft.

Introduction of Water Into the Tower

Pressure System: For this case, spray nozzles may be used with the water, either being sprayed upwards or downward, Fig. 5a. The use of spray nozzles affords a better means of distributing the water over the tower cross sectional area. Furthermore, it has been shown that the transfer coefficient in the sprays may be from two to four times as great as for the water in the packing section. (1)

Gravity System: One type, as shown by Fig. 5b discharges a jet of water directly out of a header through a smooth nozzle at low velocity, thus requiring little pressure head. However, in order to spread the water over the tower evenly, the jets of water should be allowed to fall from one to two feet, depending upon the problem, and disintegrated by splash plates. Another type, as shown in Fig. 5c involves the pumping of water onto a plate perforated with holes, or a plate perforated with nozzles. By having a head of several inches of water above these nozzles or holes, flow is established.

Again, the jets from these nozzles are broken into drops by means of splash plates from one to two feet below. The one great disadvantage to this method is that the holes or nozzles may easily clog with algae, or other foreign material, reducing the tower efficency. The maintenance of these holes requires much hand labor. This type of distribution is sometimes used in the cross flow cooling tower. Another type is shown in Fig. 5d. Here the water is led into triangular troughs, along whose edges are cut triangular overflow weirs. The jets of water emitted are allowed to fall upon splash plates for disintegration.

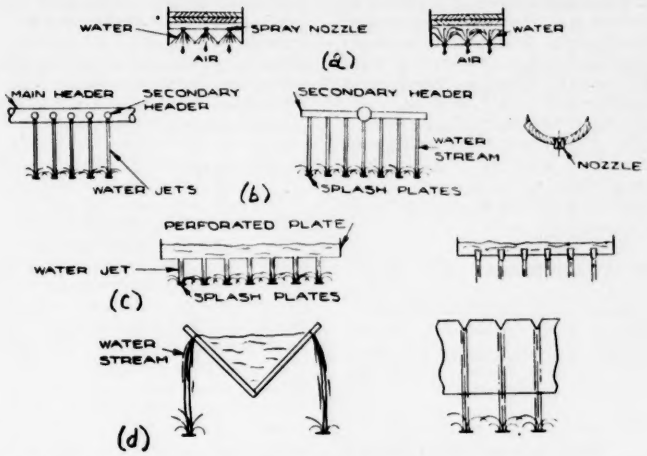


Fig. 5—How water is introduced into cooling towers. a. Pressure System, b. Pipes and Jets, c. Distributor Plate, d. Trough and Weir.

Water-Air Contact Surface Shapes

Falling Drops: Contrary to the lay conception of the shape of a falling drop, that of being streamlined, high speed photography has shown that they are either in the shape of oblate spheroids, spheres, hemispheres, saucers, and even one with a jagged surface. Fig. 6a represents some of these shapes as taken from photographs. In conjuction with the general subject of cooling tower research, Snyder has taken some data on the cooling of a freely falling water drop (2).

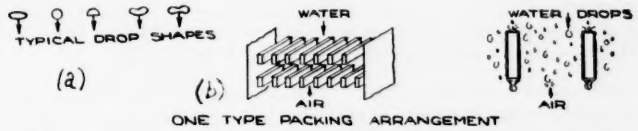


Fig. 6—Shape of water drops and methods of extending water surface.

Films of Water on Packing: Increasing the surface area of contact between water and air by introducing packing which may consist of slats of redwood, increases the performance of the tower.

Fig. 6b shows an arrangement of rectangular slats vertically positioned. After running down the surface of these slats, water forms into drops and continues through the tower until it encounters another slat. These falling drops do not necessarily move strictly vertically, but may skid sideways into the slats. Therefore, the free space which usually exists in the packed tower will not be a completely free passageway for the drops. The author has completed some research at the University of California, showing the variation of drop sizes falling from vertical slats, both as to the functions of the shape of the slats and the temperature of the water. This paper will be published in a periodical within the next year.

Types of Packing Arrangements

As shown in Figure 7a, these slats, however positioned, are individually easy to manufacture as well as to build into decks. Depending upon the design conditions, these slats may be placed differently with respect to the water and air, particularly the orientation 2, under Figure 7a, is shown to be utilized in a counter-flow cooling tower, with the direction of the slats parallel to the flow of air and water. This orientation is particularly advantageous with respect to low resistance to the flow of air. A very densely packed section of this sort may result in only a relatively small pressure drop, and yet yield a high performance for the tower, as shown by Simpson and Sherwood. (3). Further, the water is allowed to wet the packing evenly on all sides. Water drops which fall through the tower usually skid considerable distances sidewise, and therefore strike the packing slat sides.

Arrangement No. 3, in Fig. 7a, is undesirable, first because of the high resistance to the passage of air, secondly because of a certain amount of uneveness of wetting the packing. The last item may be corrected by proper sizing of the slat. Arrangement 4 in Fig. 7a allows a good passage for the air when in cross flow to the water, providing the air is moving continually parallel to the packing. In certain tower arrangements, where the cross flow is desired, there is a great tendency for the air to pass, not horizontally, but at an angle upward, thus causing a poor velocity distribution within the tower.

In arrangement 1 of Fig. 7a there is some advantage in allowing the water to fall upon the slanted side of the packing surface. This would cause a more violent dispersion of the water, due to splashing. However, the underside of the slanted packing would suffer somewhat in distribution of water film. Under these conditions, this arrangement of packing would yield pressure drops in the tower higher than that shown for arrangement 2.

Triangular Slats: The triangular slats, as shown in Fig. 7b, may be any one of a number of differently

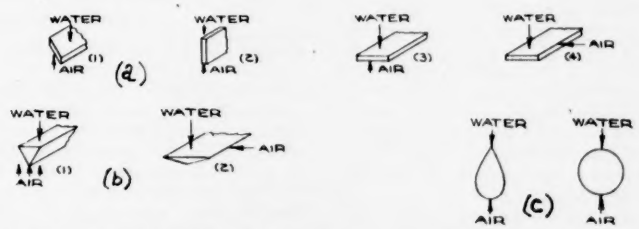


Fig. 7—Air and water contact with slats: a—flat, b—triangular, c—streamlined and cylindrical.

shaped triangles. That is, the cross section may be an equal lateral triangle or an isoceles triangle with different altitudes and bases. The arrangement, as shown in Item 1 of Fig. 7b has been thought, in some circles, to be advantageous in terms of the large flat side for splashing the water, with a gradual change in cross sections, spacing the air. However, this sort of an arrangement yields heat transfer performances below that of the straight slats shown in Item 2, Fig. 7a, and causes larger air pressure drops at higher air rates. Item 2 of Fig. 7b shows a rather shallow triangle with the general idea of distributing the water to the next deck of packing from the bottom tip of the triangle, yet allowing a small projected area facing the air flow.

The stream-lined slat has been tested by London, Mason and Boelter (4), and shown to yield a heat transfer performance which is no different than for the slat shown in Item 2, Fig. 7a, but with a lower air pressure drop. The increased cost of manufacturing this sort of slat may make them economically undesirable. The cylindrical slat, shown in Item 2, Fig. 7c is a possible type of packing, and has been mentioned only because this particular form may be found as a by-product in certain regions, such as bamboo sticks.

Large Mesh Metal Screens

These mesh screens may be placed in the tower either vertically or horizontally. In a test conducted by the author, and reported in a paper by Boelter and Hori (5), mesh screens were located at two different positions in a small spray tower. It was found that the performance of the tower increased by approximately 20 percent. For vertical sheets of mesh screen, large surface areas could be presented to the flow of water and air with the discontinuity of the water flow in the meshes causing mixing of the water. Unless the meshes are very large, the water would tend to flow in sheets and be insufficiently cooled. It was shown by Snyder (1) that water rolling down the wall of the tower in sheets is cooled only 40 percent of that accomplished in the packing of the tower. The meshes of the horizontally positioned screen become easily clogged and filled with foreign material and algae, and therefore may require considerable maintenance.

A great deal of research has been completed by Snyder at the University of California with regard to the internal performance of the tower as it is affected by air rates, water rates, density of packing, packing arrangement and spray. The first of these has been published as References 1 and 2. Others will soon be forthcoming on the effects of packing density. The authors are presently conducting a research program along these lines in a research cooling tower at the Santa Fe Tank & Tower Company.

Drift Eliminators

In order to prevent excess entrainment of water droplets with the exhaust air, scrubbers must be placed near the air outlets. These are named drift eliminators.

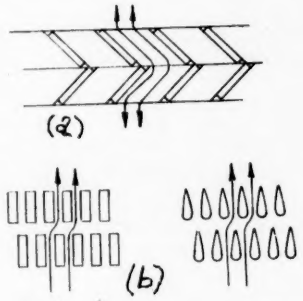


Fig. 8—Drift eliminators: a—low air speed, b—high speed.

Inspection of Fig. 8a shows a sharp change in direction of the air flow causing the water particles to impinge on the drift eliminator slat because of their greater inertia against changes in flow direction. For low air speed, the slat construction shown does not cause excessive pressure losses. Two or three decks of these drift eliminators are usually utilized.

Where high air speeds are encountered, excessive pressure drops would result with the type shown in Fig. 8a. A feasible construction would be closely packed, thin, vertical slats, or closely packed streamlined vertical slats, as shown in Fig. 8b. These would serve to cause only small changes in direction of air flow, and still induce impact of the water drop with the eliminator slats. The optimum design can be computed. Experimental data has shown drift elimination up to 98 percent, using properly designed equipment.

Tower Shape

The rectangular cross section lends itself to ease of construction and to simplicity when multiplying the tower size by just adding on individual rectangular cells. For all intensive purposes, the individual cell (a section of the tower associated with one fan) is designed as a whole for a given water rate, and then multiplied as many times as is required to account for the total water rate. These cells are so inter-connected, as shown in Fig. 9a as to actually operate individually.

The circular cross section lends itself to ease of construction and is more economical than the rectangular type, when designed for the smaller cooling loads. It is not economically feasible to use too many of these towers to take care of a large water rate. A desirable feature of the circular towers is that the air is introduced around the entire periphery at the bottom of the tower, affording better distribution of air within the tower.

Cross Section as a Function of Tower Height

The cross section of the tower may remain constant with height, or it may be varied in any one of a number of ways. Decreasing the cross sectional area of the tower, from the bottom up, means that the water loading and air loading in the packed sections per unit's cross sectional area increases with height. This would cause a higher heat transfer performance at the top of the tower with respect to the bottom. Since it is easier to cool the water at the top of the tower (where it is hottest), and more difficult to cool the water as it approaches the wet bulb tem-

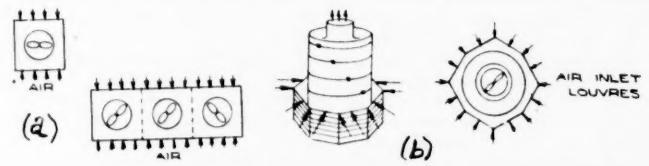


Fig. 9—a—Several square towers can be combined, b—Circular tower has good air distribution.

perature at the bottom of the tower, it is reasonably concluded that the tower should be designed for higher effectiveness at the bottom.

For example, suppose that the desired cooling range for water was 10 degrees, then for a tower in which the heat transfer coefficient is constant with height, it might take a space of 5 ft. near the top of the tower to cool the water the first 5 degrees and 15 ft. for the remaining five degrees. Such an evaluation will be made in a later paper.

A further consideration in the variable cross sectional area of the tower is that the water distribution would be poor unless some provision were made for proper distribution. Such provision might also cause higher air pressure losses.

Typical Tower Arrangements

A few of the typical arrangements of cooling towers, which include a number of the items mentioned above, are shown in the following figures with a discussion on each arrangement. Wherever possible, an indication of the air flow conditions is shown.

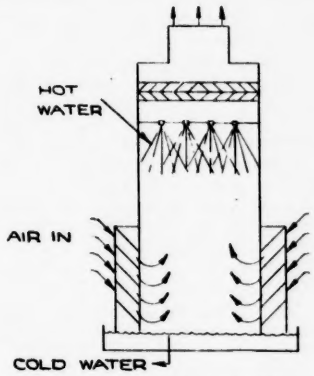


Fig. 10—Induced draft, deckless spray tower, counter flow.

The induced draft spray tower, Fig. 10, may be particularly noted for low air pressure losses, as well as the low performance per unit volume of tower. As had been stated previously, the performance near and around the spray nozzles is very high but the cooling of the falling water (below approximately 20 in. from the spray nozzles) is poor. The heat transfer coefficient decreases from 1/5 to 1/8 of the heat transfer coefficient in a packed tower. Data on this will be published by Snyder. Deckless spray towers of this type are not usable where close approaches to the wet bulb are necessary.

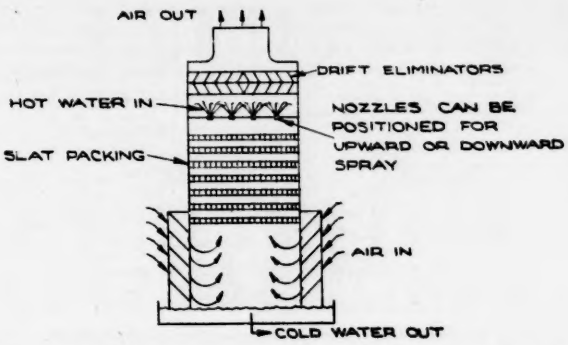


Fig. 11—Induced draft counter flow packed tower (with decks).

The sketch, Fig. 11, shows an induced draft packed counter flow cooling tower in which either downward or upward spray nozzles can be used. The distance of the drift eliminators to the nozzles is governed by the direction of spray. The air inlet at the bottom is so designed as to introduce air at a low velocity and therefore with a small pressure drop. At low velocities the air is able to turn upward into the tower with little loss due to eddying. A uniform air velocity can be established for a properly designed width of tower. Packing may extend down into the inlet region of the tower and be so positioned that it acts as a guide in changing the direction of air flow.

The packing within the tower may vary in density, positioning and shape, depending upon the problem to be solved. The sprays may serve two purposes; firstly, the transfer coefficient within the spray volume is exceedingly high and secondly, water may be distributed more evenly over the packed section. The spray sections may be relied upon to effect a large amount of cooling when properly designed, with the packed sections affecting a closer approach to the wet bulb. Such a tower is particularly useful where ground areas are restricted, with a large cooling load required because of the high performances that may be incorporated, and still possessing an economically reasonable pumping cost for air and water.

Fig. 12 shows an induced draft cross flow unit in which the fan is placed on one side of the tower. By so placing the fan with the intake louvers on the opposite side, uniform air velocities are available. Water is introduced at the top through a properly designed distribution trough which is non-clogging. Packing slats placed within the tower are usually made of horizontally positioned, rectangular slats. (See Item 4, Fig. 7a). When made into a packaged unit, high velocities of air are put through in order to have a high performance unit with a very small ground area. This sort of unit may be put into a building for an air conditioning unit, or placed on the roof. It can be made portable and produced in quantity,

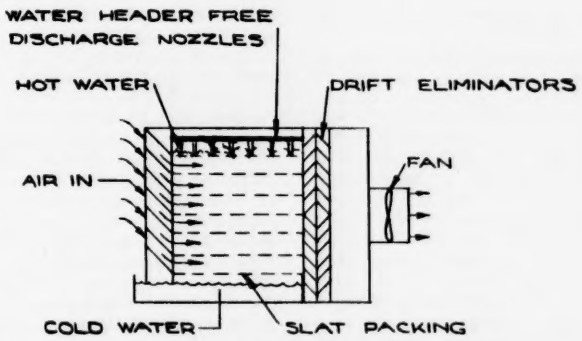


Fig. 12—Induced draft packed cross flow tower.

making it a low cost and readily available unit with great flexibility. It may be feasible in certain industries to place these units at particular points instead of pumping the water to one central tower. This would involve an economic balance with respect to the water pumping cost.

the cross flow tower may be considerably less than for the counter flow. For smaller cooling ranges, this difference may not be large.

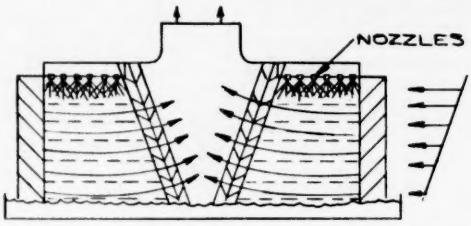


Fig. 13—Induced draft double cross flow packed tower.

The tower in Fig. 13 simulates a cross flow tower in which air flows sideways while water is falling vertically. With the fan located in the center it can be seen that air velocities will be highest near the top of the packing, and lowest at the bottom because of the difference in length of the paths required for the flow of air.

On the side of the diagram is shown a velocity distribution as measured and reported by Neet (6). This shows a velocity higher at the top than at the bottom for the entrance air. After entering the tower, the air has a tendency to turn vertically towards the fan by reason of the shorter paths of flow and the buoyant force of free convection. The volume of tower beneath the dotted line shown in the diagram would be ineffective due to lower air velocities especially near the drift eliminators. Water can be evenly distributed beneath the nozzles, as shown at the top of the tower. However, such nozzles are subjected to severe clogging when under a pressure head of only a few inches of water, particularly if exposed to the sunlight (without cover).

The large ground area taken by this type of tower is accounted for by the placing of the fans in the center with no packing beneath. (See Fig. 13). This sort of tower is not economical where ground areas are restricted, and where expensive concrete basins are required. Also, the mean temperature differences and mean absolute humidity differences are smaller, even for a perfect cross flow tower, when compared to a counter flow tower. When the cooling range is large, the mean temperature and humidity differences for

References

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(3) Simpson, W.M.: Sherwood T.K. "Performance of Small Mechanical Draft Cooling Towers", ASRE Journal, December 1946.

(4) London, A. L.: Mason, W. E., Boelter, L. M. K.: "Performance Characteristics of a Mechanically Induced Draft, Counter Flow, Packed Cooling Tower", ASME Transactions 62, 41 (1940).

(5) Boelter, L. M. K.: Hori, S.: "Performance of a Spray Tower, Transactions ASHVE 49 309, (1943).

(6) Neet, M. P.: "Cross Flow Cooling Tower Calculations". ASME Paper No. 44-SA-29, (1944).

Refrigeration Research

O. C. YOUNG, M.B.E., B.Sc., Principal Research Engineer, Pacific Fisheries Experimental Station, Vancouver, B. C., left for Ottawa July 15 and for the next two years will be attached to the Headquarters unit of the Fisheries Research Board of Canada as scientific advisor to the Chairman, Dr. G. B. Reed, Queens University. Mr. Young is well known for both his cold storage commodity research and technical engineering counsel. For many years he was in charge of railroad refrigeration car experimentation and recent transcontinental trial trips. His future duties will include: bringing to the department technological information they require. Bring back to the Board problems confronting the department. Assist in administration at headquarters.

Handbook of Material Handling

HANDBOOK of Material Handling with Industrial Trucks is a 72-page guide for the analysis of material handling operations and the application of the unit-load method with power-operated industrial trucks and accessories.

This book, entirely new in text, illustrations, charts and diagrams, together with engineering data, supplants the former Materials-Handling Handbook, also published by EITA, which ran through six editions and which was regarded as the standard authority on material handling practices employing industrial trucks.

Four Sections

Divided into four sections, the Handbook contains: 1. The Evaluation of Industrial Truck Handling; 2. Material Handling Management, with sub-sections devoted to the preparation and use of flow process charts, handling operations in production, handling in storage, the use of unit loads in storage, with layouts, commodity and capacity factors, etc.; 3. The Organization of an Industrial Truck System and, 4. Practical Truck Engineering.

Sections of the book describe the different types of industrial trucks in use; their integration of operation with other material handling systems; unit load determinations and patterns; how to charge and to change storage batteries; how to keep battery records; how to measure handling costs; routing and dispatching methods, and how to train industrial truck operators.

Different types of skids, pallets and other load carriers are illustrated and described, while the book also contains pictures showing actual applications of industrial trucks in handling and storage operations in practically every kind of industry, including automotive, bottling, canning and ceramics down through the metal trades, the paper and printing and the rubber industries.

Single copies of the book are sold for $1.00, with special quantity prices on application. Executive officials of any industry or business, making application on company letterhead to The Electric Industrial Truck Association, Department PR, 3701 North Broad Street, Philadelphia 40, Pa., will be supplied a copy of the Handbook with the compliments of EITA. This same offer of a courtesy copy is extended to deans and professors of engineering colleges and universities.

THE ICE INDUSTRY

NATIONAL ASSOCIATION OF ICE INDUSTRIES

Executive Offices
1706 L St. N. W., Washington, D.C.

Executive Secretary
Mount Taylor, Washington, D.C.

President
H. O. McLain, Chicago, Ill.

First Vice-president
E. F. Condon, Los Angeles, Calif.

Second Vice-president
Wm. J. Ayers, Memphis, Tenn.

Treasurer
Geo. Steers, Jr., Kalamazoo, Mich.

THIS MONTH IN BRIEF

Annual survey of National Association of Ice Industries shows sales of 41,342,458 tons of ice in 1949. This was less than 1948, but was 36½ percent more than ten years ago.

A mechanized refrigerator car icer has been put in service at Denver by The Denver & Rio Grande Western Railroad. It will expedite the transit of perishables during peak seasons.

Members of the Florida ice industry attended National Ice Marketing Institute field schools during June, absorbing latest ideas on selling of ice and ice-using appliances.

Illinois Merchandising Conference held at Springfield discussed up-to-date and successful selling plans now in use. The objectives and results of a rental-sales plan now being used by the City Products Corp. was fully described.

The state-wide safety campaigns of the Ohio Association of Ice Industries have paid larger dividends than any other single association activity. As a result the ice industry compensation rate in Ohio is the lowest in the nation.

ICE SALES IN 1949 41,342,458 TONS

Annual survey shows 1949 ice sales 36½ percent more than ten years ago. Tonnage decline from 1948 attributed to adverse weather. Sized and crushed ice sales show increase.

ADVERSE weather conditions played a dominant role in establishing the 1949 ice sales figures according to the annual industry survey recently released by the National Association of Ice Industries.

Total ice sales in the United States for 1949 was 41,342,458 tons. 36.5 percent more than ten years ago but a decline of 12.01 percent from the 1948 figure. Weather and weather alone is held responsible for the drop as a study of temperature records for the year showed a close parallel between weather conditions and declines in ice sales.

Gains in Sales

Gains in sales were reported for the sale of sized and crushed, unscreened ice. Sized ice accounted for 1,858,243 tons, up 2.80 percent from 1948 and crushed, unscreened ice 1,504,103 tons, up 4.86 percent. A slight reduction of 4.88 percent was reported in the sale of cube ice which accounted for 807,331 tons. Natural ice sales were 317,500 tons, .77 percent of the total of all sales.

Production readjustments of emergency capacity built during the war years was practically completed during the past operating season. Some of this marginal capacity when built was not expected to pay its way under normal competitive conditions. The fact that much of this marginal capacity was "taken off the line" in 1949 accounts for the relatively small decrease (4.13 percent) in the industry's load factor. Much of this marginal capacity, it is reported, is on a "stand-by" basis in the event of any national emergency.

Reporting on the survey, Mount Taylor, executive secretary of the National Association of Ice Industries stated that "The foregoing figures are based on a compilation and analysis of survey reports received from more than 2,000 ice plants representative of every section of the country and of every segment of the industry. The total production of these 2,000 reporting establishments was approximately one-half of that of the entire industry. The sales patterns established by these combined reports may, therefore, be used as a safe and reliable yardstick with which to measure the 1949 sales of the entire ice industry, beginning with the bench mark established by the U. S. Census of Manufacturers for 1947."

"A significant fact, revealed in this, as in the last three annual surveys, is that sales of processed—pre-

ANNUAL ICE SALES SURVEY

1949 Total Sales	**41,342,458 Tons**
Ice Cube Sales	**1,858,243 Tons**
Crushed Ice Sales	**1,504,103 Tons**
Natural Ice	**317,500 Tons**
Daily Production Capacity of Operating Plants	**254,337 Tons**

mium priced—ice have held up much better than those of block ice. Evidently, sales of processed ice are much less susceptible to varying weather conditions. Sales of ice cubes, for example, declined only 4.88 percent last year when the sale of all ice declined 12.01 percent. Sales of sized ice, nearly two million tons of it, showed a net increase of 2.8 percent, and sales of crushed ice increased 4.86 percent.

"These figures and the totals shown in Table II apply only to sales of those companies that were providing processed ice service in both 1948 and 1949. In addition, a substantial but indeterminate number of ice companies introduced processed ice service for the first time in 1949 as shown in Table III. The tonnage volume of processed ice sales of these companies which started the service in 1949 is not included in the figures shown in Table II.

"Because of this increasing number of companies providing processed ice service each year, it will be necessary to establish a new 'bench mark' for processed ice sales before dependable statistics can be compiled on the total sales of the product by the entire industry. With the known facts we already have, however, it is evident that processed ice offers one of the most attractive fields for development and promotion in the ice industry."

TOTAL I.—TOTAL ICE SALES IN UNITED STATES FROM 1945 THROUGH 1949

Division	1945 Tons	% Change Over 1944	1946 Tons	% Change Over 1945	1947 Tons	% Change Over 1946	1948 Tons	% Change Over 1947	1949 Tons	% Change Over 1948
New England	2,795,477	+ 6.3	2,802,556	+ .4	2,774,236	—1.01	2,303,430	—16.61	2,202,420	— 4.31
Eastern States	10,149,069	+ 3.7	10,436,261	+2.98	10,105,640	—3.17	8,805,881	—12.75	8,089,142	— 8.07
Southeastern	6,837,041	+ 6.3	6,964,295	+2.01	6,652,239	—4.48	6,189,128	— 6.94	5,508,501	—10.93
Southern	4,130,793	+ 9.3	4,207,661	+2.01	4,143,612	—1.52	3,956,031	— 4.53	3,334,003	—15.66
Southwestern	6,167,915	+ 6.8	6,530,299	+6.03	6,387,024	—2.19	5,934,605	— 7.08	4,826,535	—18.61
Great Lakes	10,158,807	+ 2.5	10,688,175	+4.98	10,184,773	—4.70	8,728,344	—14.28	7,616,718	—12.67
Western	4,176,095	+ 2.1	4,466,893	+7.12	4,353,010	—2.55	3,757,786	—13.63	3,222,875	—14.17
Mountain States	1,614,316	+ 9.0	1,720,119	+6.71	1,749,371	+1.70	1,573,569	—10.04	1,379,608	—12.26
Pacific Coast	5,741,673	+12.3	5,817,558	+1.47	5,808,698	—0.15	5,080,038	—12.53	4,576,302	— 9.84
Northwestern	812,489	+ 8.8	802,702	—1.06	806,018	+0.41	661,400	—16.71	586,354	—11.28
TOTAL U. S.	52,583,675	+ 5.69	54,436,519	+3.52	52,964,621	—2.81	46,990,212	—11.28	41,342,458	—12.01

TABLE II.—TOTAL ESTIMATED SALES OF PROCESSED ICE IN TONS

Division	Ice Cubes 1947	Ice Cubes 1948	Ice Cubes 1949	Sized Ice 1947	Sized Ice 1948	Sized Ice 1949	Crushed Ice 1947	Crushed Ice 1948	Crushed Ice 1949
New England	56,853	58,831	67,532	43,503	45,327	56,643	49,142	52,194	66,087
Eastern States	247,451	271,596	252,691	348,584	418,450	450,266	187,447	188,449	209,472
Southeastern	63,473	64,605	66,224	271,447	267,239	267,403	176,245	164,854	170,873
Southern	17,371	10,422	9,990	71,809	72,819	67,777	54,758	54,546	49,956
Southwestern	31,705	15,993	16,225	143,077	163,337	165,663	453,320	487,303	456,598
Great Lakes	182,579	189,886	178,942	442,793	443,279	437,251	247,104	224,025	273,524
Western	93,992	88,721	77,209	161,383	168,189	168,435	136,539	152,998	159,812
Mountain States	14,243	16,007	14,135	45,384	49,551	46,791	16,411	16,890	20,177
Pacific Coast	140,955	132,084	123,396	164,042	165,428	177,133	82,040	56,218	52,660
Northwestern	560	578	897	13,128	14,010	20,881	30,383	36,915	44,944
TOTAL U. S.	849,182	848,723	807,331	1,705,150	1,807,629	1,858,243	1,433,389	1,434,392	1,504,103
% Change Over Preceding Year	+33.3%	— .05%	—4.877%	+35.1%	+6.02%	+2.80%	+15.3%	+ .07%	+4.86%

TABLE III.—PERCENTAGE OF COMPANIES PROVIDING PROCESSED ICE SERVICE

Division	Ice Cube Service 1947	Ice Cube Service 1948	Ice Cube Service 1949	Sized Ice Service 1947	Sized Ice Service 1948	Sized Ice Service 1949	Crushed Ice Service 1947	Crushed Ice Service 1948	Crushed Ice Service 1949
	Percentage of Reporting Companies Providing								
New England	55.3%	55.7%	65.6%	36.8%	27.9%	53.1%	36.8%	41.8%	65.6%
Eastern States	42.7%	38.2%	38.8%	37.3%	30.9%	40.8%	59.8%	40.0%	56.3%
Southeastern	12.9%	16.6%	12.5%	19.8%	19.7%	25.1%	42.7%	44.8%	62.2%
Southern	12.2%	7.5%	11.5%	29.2%	21.7%	29.5%	39.0%	29.0%	57.7%
Southwestern	11.8%	4.7%	15.7%	27.9%	15.3%	21.9%	57.2%	56.4%	73.2%
Great Lakes	43.4%	41.3%	48.0%	39.6%	32.7%	44.1%	45.9%	40.7%	56.4%
Western	26.6%	25.9%	29.7%	23.3%	25.9%	35.6%	60.5%	50.0%	60.2%
Mountain States	27.5%	38.1%	52.2%	27.5%	33.4%	43.5%	55.0%	38.1%	65.2%
Pacific Coast	58.6%	63.2%	62.1%	20.6%	26.2%	37.8%	44.7%	31.6%	54.1%
Northwestern	15.7%	15.3%	22.7%	21.0%	15.3%	45.4%	52.6%	45.0%	54.5%
TOTAL U. S.	29.5%	28.1%	31.76%	29.5%	25.3%	35.46%	42.4%	48.5%	60.33%

Ice Marketing Institute Announces New Courses

THE National Ice Marketing Institute courses for sales and supervisory management will be resumed again by the National Association of Ice Industries this Fall. One two-weeks' school is offered for the period September 18-29 in Washington. Those who are interested in enrolling one or more men in this two-weeks' school, are asked to send in their applications promptly to the National Association.

Plans have been submitted to all Unit Association Secretaries for conducting again basic one-week field courses of the National Ice Marketing Institute in the territories of those who wish to sponsor such classes. These field courses are an abbreviated version of the Washington School. They cover the principles and practices of ice merchandising, personnel selection, training and supervision. They are condensed, concentrated, stressing fundamentals. Over-all cost of sending men to a local, one-week school naturally is considerably less than attending the Washington School.

Dates are available for running approximately one of the field schools each month from October to June, inclusive. Dates will be scheduled with the Unit Associations in the order of receipt of their signed contracts for definite arrangements, prior to September 1.

The national and field schools have produced tangible, profit-making results for those members who have enrolled men. Moreover, the men themselves have received a new spirit and renewed enthusiasm for the ice business that will continue to produce real results for many years. Enrollments are requested not later than August 15.

Iced Tea Promotion

MORE than 17,000 posters (June 1950, ICE AND REFRIGERATION, page 49) are now making the public conscious of iced tea weather. Hundreds of ice companies responded to the Tea Bureau's offer through the Public Relations Department, National Association of Ice Industries and are displaying a colorful poster which encourages the "use of plenty of ice." At the recent National Restaurant Association Exhibit in Chicago, the Tea Bureau and N.A.I.I.'s Public Relations Department cooperated in dispensing tea using 41,800 iceman's ice cubes in 11,142 glasses of ice tea.

Suit Over Ice Price War

THE Rubel Corp. of New York City has filed suit in federal court charging the Losquadro Coal Corp., Weehawken, with waging a drastic price war in wholesale ice in an attempt to drive the Rubel company from that market. The suit, which asks damages of $150,000, also names as defendants Gerardo, William V. and Rocco Losquadro, officers of the Weehawken company.

According to the complaint, the price war started after the two firms entered into an agreement last December 1 under which Losquadro was to buy all its ice from Rubel for a three-year period. Within two months, the suit charges, the agreement was broken and the defendants began a conspiracy to ruin Rubel's business in northern New Jersey and force Rubel to pay the defendants "large sums of money in order to desist from such practices." In addition, it is alleged, the defendants demanded that Rubel buy its oil and have its trucking done by the Weehawken company and "threatened that the plantiff would suffer serious consequences if such an agreement were not executed."

After Rubel refused the demands, the suit states, Losquadro began cutting the price of ice to dealers and has been selling ice from their Weehawken plant at 35 cents a cake, although the price in the neighboring area is 65 cents a cake. To further the conspiracy, it is charged, Losquadro made an agreement last May with J. D. Roberto, under which Roberto is operating a "box" and ice platform at 214 New York Ave., Jersey City, less than a mile from one of Losquadro's plants and selling ice at the 35 cent price.

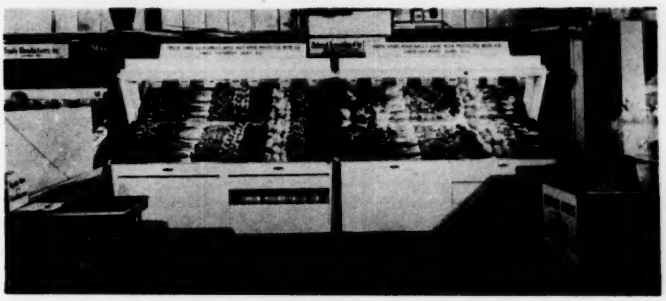
The Rubel company asks the court for a permanent injunction restraining the defendants from continuing the alleged practices and for reimbursement of damages which amount to "at least $150,000."

Ice Display to be Repeated At Indiana State Fair

THE Indiana Association of Ice Industries will again participate in the exhibiting activities at the Indiana State Fair Horticulture Building. Robert W. Walton, secretary, met with officials of the Indiana Vegetable Growers Association where details were worked out for a cooperative program similar to the exhibit at the 1949 State Fair. This group won first prize in last year's competition by utilizing ice displays. It is hoped that this performance can be repeated in 1950.

It is also planned to preserve the Grand Champion 4-H garden exhibits on ice as done previously for the 1949 winner. The association owns a specially constructed case which is used to display the winning vegetables at the Horticulture Building. Much favorable public reaction was experienced in 1949 to this new feature, and it is felt that this program is most effective in demonstrating the effectiveness of ice in preserving perishables.

Grocers See Ice-Displayed Vegetables at Convention



Hundreds of grocers saw ice-displayed vegetables stay in perfect condition for six days in the National Association of Ice Industries booth at the National Association of Retail Grocers' Convention. Much of the produce in the adjoining dry rack spoiled and had to be discarded. The covention took place at the Navy Pier in Chicago June 4-8. A. M. Andrich and John G. Pool of the National Association of Ice Industries were in attendance at the booth.

The Ice Industry

Canadian Grocers Approve Iced Vegetable Displays

THERE is evidence of unusual interest on the part of grocers and food merchants in iced vegetable displays in Canada, according to a bulletin issued by the Canadian Association of Ice Industries. There are some twenty odd food and produce trade papers published in Canada and many of them are carrying regular articles and features on iced vegetable displays. At conventions and conferences held by food store operators a part of the program invariably is devoted to this type of merchandising. At Saskatoon on May 31 the ice industry's motion picture film "Naturally Yours" was shown in connection with a demonstration of vegetable icing which included an iced vegetable display case completely set up and in operation. At Regina on June 5 and 6 the Retail Merchants Association also exhibited the film in connection with a demonstration of ice vegetable display merchandising.

Until the present time, display equipment for this purpose was not readily available and produce merchants converted other equipment to iced vegetable display, or had equipment built to their own design. Cases are now becoming available in Canada from at least two sources.

Canadian Ice Foundation iced vegetable display advertising is appearing at present in the Canadian Grocer, Prairie Grocer, National News, Retail Grocer & Provisioner and L'Epicier. Also a new two-color bulletin is being prepared for the use of ice dealers in developing this business in their local communities. This bulletin will illustrate the new equipment.

Ice Prices Corrected

A CORRECTION has been received for the ice prices published in the May issue of ICE AND REFRIGERATION for Mount Holly, N. J. For domestic trade delivered, the price is 70 cents per 100 lbs. instead of $1.00; all commercial delivered should be 50 instead of 80 cents per 100 lbs.; heavy commercial should be $10.00 instead of $12.00 per ton; prices to peddlers and dealers at platform should be $4.67 instead of $12.00 and reicing produce trucks should read $6.66 instead of $7.50 per ton.

Icing of Sweet Corn In Indiana

ICING of sweet corn to assure garden freshness will be carried on in Indiana again this year on a larger scale. A total of 600 acres was iced and sold last year. Consumers accepted this quality corn enthusiastically, and stores reported repeat sales. Icing of the roasting ears prevents sugar loss, due to conversion of sugar to starch which increases when temperatures rise. When iced, the ears retain freshness and sweetness for a longer period. Growers waste no time shipping sweet corn to market after it is snapped.

With package icing, the corn is graded five dozen ears per crate. About 15 to 18 pounds of snow ice is applied on top. The crates are loaded on a truck and about four inches of snow ice is spread across the top of the load. The truck is covered with a tarpaulin to protect the corn from the sun and air. It is the latest development in marketing sweet corn. Consumers pay a few pennies more for iced roasting ears but they say it is well worth the additional cost.

Purdue University is again in 1950 behind the scenes in developing information on this highly important merchandising method. It is expected that J. Vandemark of Purdue University, who supervised last year's highly successful program, will have an assistant working on certain statistical information relative to the icing of sweet corn. It is further expected that information developed during 1950 will do much to aid in standardizing marketing procedures.

Andrich Leaves N.A.I.I. to Open Consulting Service

A. M. (Andy) ANDRICH opened a Fresh Fruit and Vegetable Consultant Service at 16700 Pearldale Ave., Cleveland, Ohio, on July 1, leaving the National Association of Ice Industries which he served as field director since January 1947. His consulting service will provide expect advice on approved methods of handling fresh fruits and vegetables at the retail level and will be available to produce handlers and ice producers.

As field director of N.A.I.I., Mr. Andrich traveled to every major city in the country demonstrating the iced vegetable display method of better selling. Prior to his N.A.I.I. affiliation he was in charge of the entire fresh fruit and vegetable operation of Fisher Bros. Co., Cleveland, Ohio, of more than 300 stores.

Letter to Magazine Draws Inquiries from Readers

A LETTER from John G. Pool, Jr., of the National Association of Ice Industries in "Kiplinger's Magazine" pointed out that in a previous article on the increasing prevalence of automatic vending machines, the ice vendor had been omitted. A number of inquiries were received from readers wanting to know about ice vending machines and many of them had been unaware that such stations existed until reading the letter which follows:

In 'Vending Machines' (February issue) you skipped the biggest "silent salesman" of them all—the automatic ice dispenser. Those little houses now rapidly popping up next to filling stations and supermarkets will sell you a 50-pound block of ice or a carton of ice cubes or a bag of crushed ice.

Party throwers and picnic-goers are steady patrons of the ice vendors. In fact a survey showed that nearly 50 percent of the people in this country regularly buy supplementary ice.

The ice vending machine, by the way, is one of many bits of proof that the ice industry, written off by most Americans twenty five years ago, not only is still alive but is moving right ahead with the changing times.

Though few realize it, as much ice is sold nationally today as was sold before the advent of mechanical refrigerators. Surprising, but true."

JOHN G. POOL JR.
National Association of
Ice Industries,
Washington, D. C.

Ice Dealer Brings Showroom to Customer

ONE of the foremost merchandisers in the Canadian ice industry is the Belle Ewart Ice & Fuel Co. of Toronto which firm does an outstanding ice refrigerator selling job in Toronto. Not content with bringing prospects to its showrooms, this company has adopted trailer demonstration. As leads are secured through telephone calls and routemen's contacts, a representative takes the trailer right to the home of the prospect. The trailer accommodates three modern refrigerators nicely, and after a demonstration and sales talk, the representative is ready to install the refrigerator right "on the spot."

$100,000 Injury Suit

SUIT for $100,000 was filed July 6 against the Consumer's Coal & Ice Co. and the Arctic Ice & Coal Co., Memphis, Tenn. by Mrs. Lottye Prather who claims payment for injuries when both legs were fractured by one of the company's trucks.

Texas Utilities Sells Ice Properties

THE West Texas Utilities Co. has sold to the City of San Angelo, Tex., its municipal water system in that city and has disposed of its ice properties in several towns to the West Texas Ice Co.

Ice plants and properties sold are at Presidio, Eldorado, Marfa, Alpine, San Angelo, Vernon, Quanah, Chillicothe, Childress, Estelline, Hedley and Memphis, Tex., together with a number of other ice sales stations and equipment.

Heading the West Texas Ice Co. is J. L. Shaw, president, who is also president of the Bond Ice Co. of Carlsbad, N. Mex., a member of the Carlsbad city council and operator of other ice properties in Roswell and Artesia. Texas headquarters for the company will be established in San Angelo. The sale which may be subject to the jurisdiction and action of the Securities and Exchange Commission, was to become effective immediately.

Talk on Rail Refrigeration

THE history of railroad refrigeration was discussed recently by B. C. Ward of Ogden, Utah, superintendent of the Pacific Fruit Express, at a meeting of the Boise Kiwanis Club. He told the group that when Pacific Fruit Express began in 1906, it had 600 refrigerator cars and now has 38,600 such cars. He said that railroad refrigeration plays a vital part in today's living since most large cities in the country depend on refrigerator cars to keep them supplied with fresh fruit.

Ice Research Continued

TO CONTINUE and expand research work on iced vegetables, that has been done by the University of Massachusetts under the direction of Professor Grant M. Snyder, another grant of $1,000 has been made, $750 from the National Association of Ice Industries and $250 from the New England Ice Association.

Conrades Heads Coal Group

PAUL E. CONRADES, president of the Merchants Ice & Coal Co., St. Louis, was elected president of the American Retail Coal Association at the organization's fifteenth annual meeting held in St. Louis recently. Mr. Conrades is also serving currently as vice-president of the St. Louis Association of Ice Industries.

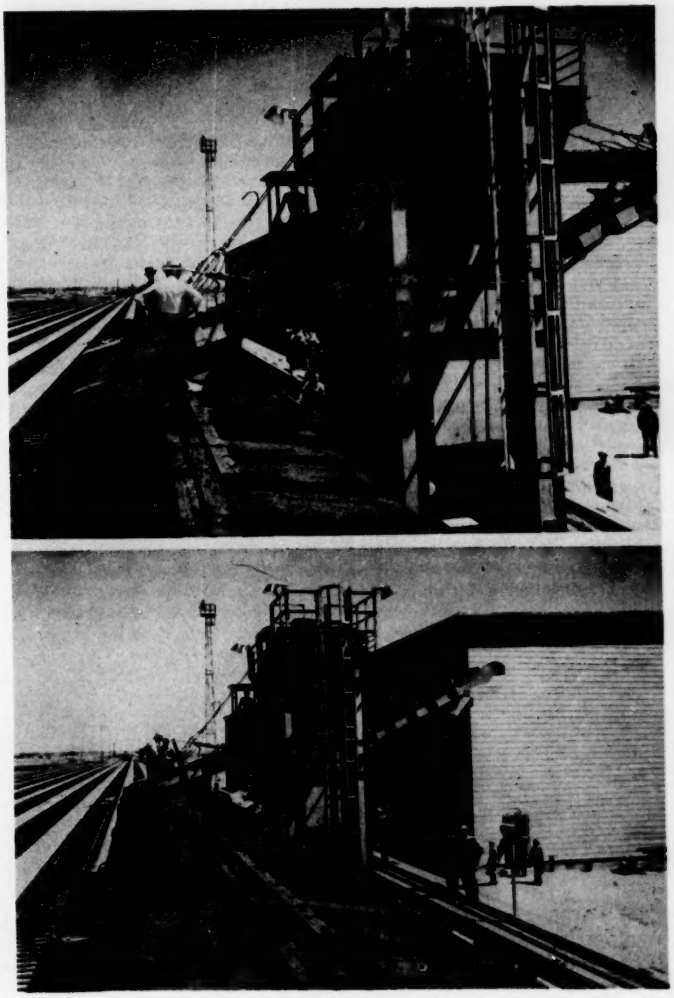
Mechanized Icer Operating at Denver

THE recently installed mechanized refrigerator car icer of the Denver, Rio Grande Western Railroad at Denver, Colo., will expedite the transit of perishables during peak season production which formerly was a serious "bottleneck."

The mechanical icer is a duplicate of the installation described in ICE AND REFRIGERATION, April 1950 issue, page 15.

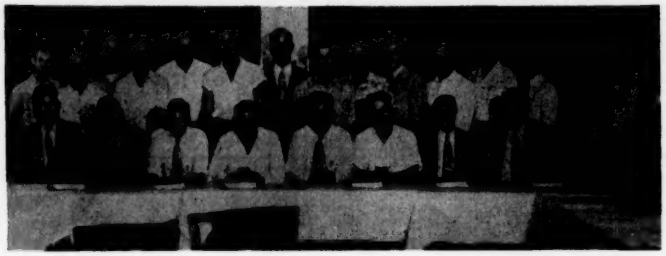
The D.R.G.&W. icer is located at the north Denver yards adjacent to a 16,000 ton ice storage. Last year the Rio Grande handled 2,675 cars from the west slope and the number has been as high as 3,175, all coming along within two to three weeks and three-quarters of them within ten days. Help was formerly required from the Burlington and Union Pacific.

All told, the Rio Grande was declared to handle between 18,000 to 21,000 cars annually of perishable products including potatoes, apples, pears, spinach and peas, some of the cars coming through from the west coast.



Views of mechanized refrigerator car icer placed in service by Denver & Rio Grande Western Railroad at Denver, Colo., showing refrigerator car being iced.

Florida Training School Graduates 23 Final Session for This Summer



Pictured at completion of their course are the 23 graduates of the N.A.I.I.'s final field school of the summer, held June 26-July 1 at Miami. With them is National Ice Marketing Institute Superintendent Thomas W. Douglas (seated, third from right), who conducted the session.

TWENTY-three executives of southern Florida ice companies were awarded certificates July 1 as graduates of the NAII Department of Personnel Training and Marketing field school session in Miami. It was the final session scheduled for the school this summer.

The enrollees, whose experience in the Ice industry totalled 247 years, utilized a room at The Seven Seas Restaurant for the six-day course. Special lecturers were heard, as follows: Dr. Victor W. Bennett, University of Miami, "Merchandising;" Prof. Donald Sprague, University of Miami, "Public Speaking;" H. F. Thompson, Dade County Dept. of Vocational Education, "Individual Training;" Vernon Bronson, also of that Department, "Group Training;" and L. P. Hoffman, Florida Power & Light Company, "Accident Prevention." Fred Angel, City Products Corporation, Miami, a member of the class, led the group discussion of vegetable icing.

The following were elected class officers: Orval Sloan, City Products Corp., Fort Myers, president; Bill Lohman, City Products Corp., Miami, vice president; Ray Bridges, City Products Corp., Miami, secretary; and Bill Shaddix, Pure Ice Co., Daytona Beach, treasurer.

One of the highlights of the school was the visit of the officers of the Florida Ice Association and members of the executive committee. The visitors included Frank M. Pumphrey, association president; E. E. Melton, vice-president; H. R. Kahler, treasurer; Miss Muriel Washburn, secretary; and Herbert R. Beers, Glen Greene, Roy Hickman, M. Louis Hill and Henry Sorenson.

At the Saturday graduation luncheon, certificates were presented by Dr. Thomas W. Douglas, superintendent of the National Ice Marketing Institute. In addition to the class officers named above and Mr. Angel, these men attended the school:

From the City Products Corporation in their respective cities, Paul E. Jarvis, Willard J. Lambie, Olan A. Nelms, and Royal O. White, all of Miami; Charles Davis, Fort Lauderdale; C. R. Hoppes, Cocoa; Harry Peters, Belle Glade, and Russell Vann, Melbourne. From the Royal Palm Ice Company, Danny Forshee and J. W. McCollister, Miami; Richard E. MacCullough, Miami Beach; John W. Kenyon and John H. Taylor, Homestead; Frank Dominguez, Fort Pierce; William J. Lucas, Kissimmee, and Edward Wilkinson, DelRay Beach. Others were G. N. Torlino of the Jackson Ice Co., St. Petersburg, and Jack Whisnant of the Whisnant Ice Co., Immokalee.

Seventh Field School

THE New Florida Hotel in Lakeland, Fla., served as classroom for the seventh National Ice Marketing Institute field school conducted by the NAII Personnel Training and Marketing Department. The school session began Monday, June 5, and concluded the following Saturday, with 11 men earning certificates of graduation.

The group, whose experience in the ice industry totalled 168 years, named itself the John Gorrie Centennial Class. Elected class officers were the following: Joe R. Gramling, Arctic Ice Company, Inc., Plant City, president; J. Ed. Best, City Products Corporation, Daytona Beach, vice president; Henry Brewton, City Products Corporation, St. Augustine, secretary-treasurer.

Six visiting lecturers were heard, supplementing the regular conference-style instruction. With their subjects, they were: Edward Mockler, City Products Corp., Chicago, "Vegetable Icing;" G. Lawrence Roberts, University of Tampa, "Merchandising;" James E. Dillinger, Florida Southern College, "Public Speaking;" Mrs. Leona Bryant, Dept. of Vocational Education, Hillsborough County, Florida, "Job Demonstrations;" Ernest Adams, also of that department, "Conference Leading;" Harold A. Heiser, University of Tampa, "Supervision and Leadership."

Besides the three class officers, these men completed the course: Lawrence Ashton, Perry; Elwood O. Harrell, Titusville; and Johnny Pound, Palatka, all of the City Products Corporation; Dwight Edgemon and Joe Poppell, both of the Arctic Ice Company, Inc., Plant City; Robert Gibson, Avon Ice Company, Avon Park; Roy Hickman, Community Ice & Storage Company, Wauchula; and Oscar McNeal, Polk Ice Company, Mulberry.

Members of the Lakeland, Fla. National Ice Marketing Institute field school pose at graduation. Seated, at left, is Miss Muriel Washburn, secretary of the Florida Ice Association.

Reports from Unit Ice Associations

California Association of Ice Industries

JACK L. DAWSON, Exec. Mgr.

DUE to unfavorable weather conditions prevailing for the first five months of this year, ice tonnage dropped considerably from that enjoyed during the same period in previous years. The month of June has found tonnage materially increased and we are very hopeful of having an overall successful season. It might be added that while ice tonnage has been off somewhat, the sale of equipment has maintained at a high level particularly with respect to poultry and vegetable display cases and ice-cooled draft beer-dispensing units.

It is felt that the newly-organized Merchandising Forum within the California Association of Ice Industries is responsible to a great degree for the enthusiastic and successful merchandising of ice equipment. Two of these forums have been held in Los Angeles and one in Sacramento.

At the Board of Directors' meeting on June 9 it was decided to hold our 1950 convention in San Francisco during the first part of December. Tentative dates of December 4 and 5 have been selected for this occasion.

Cape Cod Ice Association

THE reactivated Cape Cod Unit of the New England Ice Association has a sales minded president in the person of Warren A. Peirce, Red River Ice Plant, South Harwich, Mass.

It was recently reported that Mr. Peirce sold seven ice refrigerators in a two week period with good prospects for an additional ten sales. In the same period he sold an ice vegetable case with several other commercial equipment sales in sight. His company is now merchandising sized ice in 10, 25 and 50 pound bags.

It is likely since this report, a number of new customers are better acquainted with the advantages of ice refrigeration, because of Mr. Peirce's activities.

New Oklahoma Secretary

THE appointment of Harry T. Hudson as executive secretary and general counsel has been announced by the Oklahoma Association of Ice Industries. Mr. Hudson succeeds Walter Hadley, who resigned recently. The new association address will be 708-9 Perrine Building, Oklahoma City, Okla.

Illinois Merchandising Conference Discusses Selling

THE Illinois Merchandising Conference held in Springfield, Ill., June 11, in the opinion of those present, was one of the best of its kind ever held. The number in attendance exceeded that of recent meetings, the program was most interesting and informative, filled with reports of the most recent, up-to-date and successful plans now in use and the interest and participation was excellent. Everyone present felt that they had been benefitted and the fact that the meeting continued until a relatively late hour, was proof of their interest. As a result, it is expected that the next meeting will be even better attended.

Retail Salesroom

The chief speaker was George V. Warren, merchandising manager, City Products Corp., who is directing the nation-wide rental and sales plans now in effect and operation in the company's many plants. Mr. Warren described in detail the objectives of the plans, both commercial and domestic, how they work in actual practice, the results obtained to date, which, by the way has resulted in placing in excess of 3000 new units of equipment in the hands of customers and increased the sale of ice materially, particularly crushed and sized.

After the formal presentation was concluded many questions were asked and answered. City Products has made this plan available to the industry by means of a portfolio, identical to that furnished their own company managers and supervisors. This portfolio contains all the details of the plans and instructions necessary to put it into operation and includes a sample of every printed form used, for both commercial and domestic.

Merchandising Campaign

Another interesting speaker was Everett Watters, sales promotion and advertising manager, Brown-Lynch-Scott Co., Monmouth, Ill. This company operates 30 outlets in Illinois and Iowa, enjoys an enviable reputation in the field and is expanding rapidly. Mr. Watters described the details in planning and checks involved in preparation for launching a merchandising campaign, the training given employees, media used for advertising purposes, close attention to details during the campaign and finally, a check on results obtained.

His presentation was most interesting and gave a clear insight into the inner workings of a wideawake concern, merchandising in a highly competitive market. In the discussion following, Mr. Watters suggested a number of things ice companies could do to make sales efforts more effective.

Lee Veara of Springfield described the rental-service plan in effect in the properties of Central Illinois Ice Co. which is working very well and getting results. He also distributed samples of a novelty item which has been effective in increasing sale of ice cubes.

Alert to new items which may be sold profitably at ice platforms and stations, Karl Pflanz and Fred Bujnak

Officers of Cape Cod Unit, New England Ice Association. Left to right: Harry Drew, secretary-treasurer, West Chatham, Mass.; O. C. Robshaw, (not an officer); Homer Phinney, vice-president, Hyannis, Mass.; Warren Peirce, president, South Harwich, Mass.

of the St. Clair Ice Co., Belleville, Ill., told of their success in selling hickory charcoal pellets, charcoal grills and Charco-Fyre, a liquid for igniting the charcoal. These items for outdoor cookery are a natural for sale to campers, picknickers and back yard barbecuers.

During the meeting, vending machines, vegetable and poultry icing and many other subjects were discussed. Present also were Wm. Barnhart, Ice Cooling Appliance Corp., Morrison, Ill.; R. O. Boggs, Sanitary Equipment Mfg. Co., St. Louis, and Ralph Binkert, Progress Refrigerator Co., Louisville, Ky., all of whom contributed greatly to the success of the meeting.

Accidents Reduced in Ohio by Safety Campaigns

By Guy W. Jacobs, Secy-Treas.

THE Merchandising and Safety Committees of the Ohio Association held meetings last month and mapped out their activities for the current year. The Safety Committee reviewed the initial results of the state-wide safety campaign and were highly gratified with the reports for the first two months. Although the hours of exposure were less than normal for that time of the year the frequency and severity rates showed a downward trend.

No other single activity of this association has paid larger dividends to the participants than have these annual safety campaigns. The reduction in our Workmen's Compensation Rate has been phenomenal during the years that the safety program has been in progress until today it is the lowest ice industry compensation rate in the nation. From a dollars and cents standpoint, therefore, the effort has been much worthwhile. Accidents have been reduced, both in number and in severity, and both the employers and the employees have reaped the rewards.

At its meeting, the Merchandising Committee authorized ice industry exhibits, as usual, at the Ohio State Fair and the Ohio Retail Grocers convention during 1950. Tentative plans for the participation of the association in these events were made and we are happy to report that "Bill" Cunningham was again prevailed upon to personally look after the display at the State Fair next month. The exhibit will be housed at its usual location in the Columbus Building.

The committee discussed at length various local merchandising programs which were being used by some of our members. The rental plan of placing ice-using equipment, as developed and refined by the City Products Corp., and which they refer to as their "Wonder Plan," was recommended for the consideration of all members of the ice industry. This plan of placing ice equipment has resulted in putting thousands of new units in the hands of customers and has materially increased the sale of ice, particularly crushed and sized.

The use of novelty items, designed primarily to increase the sale of ice cubes, was discussed and recommended to the industry. This method of merchandising has been effective in many markets but particularly in the Akron area. Full and complete information concerning the use of such items can be obtained by writing the ServIce Delivery Co., 551 South High St., Akron.

Poultry Icing

The committee discussed at great length the possibilities inherent in the poultry icing program which is now being pushed in a big way by Swift & Co. It was felt that this program is deserving of every iceman's attention and consideration for, if it develops as now seems likely, it will means thousands of tons of new ice business. Although Swift & Co. is pioneering the development of this revolutionary method of handling poultry, many other producers and distributors will use the same means of guaranteeing that absolutely fresh poultry will be available at all times in every city, town and hamlet in the United States. It was the committee's suggestion that ice men be reminded of this opportunity. It was further suggested that in their quest for new ice business they establish contact with the Swift representative in their area; also, that they become acquainted with the other handlers of fresh poultry in their market area.

The use of automatic vending equipment to increase the sale of ice was also discussed. Reports from the companies that have pioneered in this field show a steady increase in the sales of ice from vending stations. Much information on this subject is now available, not only from the companies which manufacture and sell the equipment but from the ice companies which have done the pioneering.

While the committee fully realized and discussed some of the inherent difficulties in the vending of ice, they were of the opinion that every ice company should be making a careful survey of its market with the thought in mind of supplementing its other services with this means of distribution. The records of many companies show that by far the greater amount of ice sold from their vending stations is new business—business created by the availability of the commodity and the convenience of self-service at all hours of the day and night—and at a profit-making price, too.

The committee was also of the opinion that the vegetable icing program has not been developed to the extent that it should have been. In some market areas practically all retail outlets are icing their fresh vegetables and fruits, offering them to the public in their original garden-freshness and vitamin-richness. However, in spite of this splendid work in some localities, the fact remains that in many localities the surface has not even been scratched. Many tons of additional ice business could be secured by an all-out effort to popularize this improved method of fresh fruit and vegetable handling.

Annual Convention

At their last meeting, the board of directors arranged for the next annual convention which will be held at the Deshler-Wallick Hotel, Columbus Monday and Tuesday, February 26 and 27, 1951.

Missouri Ice Merchandising Forum

THE fall meeting of the Missouri Ice Merchandising Forum has been scheduled for Tuesday, September 26 at the Missouri Hotel in Jefferson City. An interesting program will be presented and all Missouri ice men interested in the subject of merchandising are urged to have a representative present.

Indiana Merchandising Forum

THERE will be a state-wide meeting of the Indiana Ice Merchandising Forum on Wednesday, August 23, 1950 at the Lincoln Hotel, commencing at 10:30 a.m. Indiana ice men are urged to attend this meeting and exchange merchandising ideas.

Refrigerated Warehousing Industry

NATIONAL ASSOCIATION of REFRIGERATED WAREHOUSES

Division of American Warehousemen's Association

Executive Offices
TOWER BUILDING, WASHINGTON 5, D.C.

Executive Vice-president
WM. DALTON, WASHINGTON, D.C.

Secretary
JOS. H. COLQUITT, WASHINGTON, D.C.

President
J. L. GAGINI, OMAHA, NEB.

Vice-president
J. P. JOHNSON, WASHINGTON, D.C.

Treasurer
WM. A. MOORE, NEW ORLEANS, LA.

THIS MONTH IN BRIEF

Report by Fish & Wildlife Service on the outlook for fishery products indicates that the markets will be moderately active during the third quarter, with prices generally firm.

A regional training conference will be held by The Refrigeration Research Foundation at Newark, N. J. September 18 to 21. In addition to technical instruction and discussions, sessions will be devoted to public and employee relations.

Cold storage holdings for July 1 show an increase for both cooler and freezer space, with moderate increases reported by most states.

Storage tests have been made on Gravenstein apples by the California Experiment Station, showing that storage helps to lengthen the salable life, but that they should not be held over two or three months for the California market and not over two months for the eastern market.

THE OUTLOOK FOR FROZEN FISH

Fish and Wildlife Service expects markets to be moderately active during third quarter of 1950, with price structure generally firm.

ACCORDING to a report issued by the Fish & Wildlife Service of the United States Department of Agriculture, markets for edible fishery products are expected to be moderately active during the third quarter, probably somewhat more than usual, with the price structure generally rather firm. This quarter usually sees an active demand for most of the major types of canned fish and some slackening of the demand for fresh and frozen fish. In this quarter, however, though prices of meat may decline, they will still be high enough so that the demand for fresh and frozen fishery products will be stimulated somewhat. Competition between various edible fishery products, nevertheless, will be keen. In the by-products field, the markets are expected to be duller, and the marketing difficulties more pronounced.

The third quarter of the year marks the peak of fish production. The catch in this quarter is about 40 percent of the entire catch for the year. Nearly half the yearly catch of fish and shellfish used for canning and more than half the yearly catch used in the manufacture of by-products, are ordinarily produced in this three-month period, the peak usually coming in August. The catch destined for sale as fresh and frozen fish and shellfish drops off somewhat from the previous quarter. Since pilchard or sardine production on the Pacific Coast is a major contributor to the catch in the latter part of the quarter, the total volume of fishery production during the period hinges, to a considerable extent, on the unpredictable supply from this source.

Among the operations that usually reach or approach their maximum rate during this quarter is the canning of salmon, shrimp, sardines and tuna. The great reduction operations for the production of fish meal and fish oil are also in full swing. Menhaden reduction is at its maximum during this quarter, and the catch of pilchards or sardines on the Pacific Coast, the season for which begins in August in northern California, is increasing rapidly as the quarter closes. The catch of mackerel, swordfish, sablefish or black cod, and whiting, to name a few only, are also at their zeniths at some time during the quarter.

Effect of Carry-Over

The effect of the carry-over of frozen and cured fish and shellfish is a factor of importance in determining price levels of fishery products. May 1 is about the low point of cold storage holdings, and since data are gathered only at monthly intervals, it is the point at which the carry-over should be examined. Moreover, cured fish holdings are usually near their lowest level at this time. Although this is not the low point of storage

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NOTE: As this publication goes to press, the Korean incident has developed in seriousness. Forecasts should be viewed in the light of changes that may be brought about by this unexpected development. Unless the dispute is settled soon, the strengthening of markets that it has caused, is likely to extend to foods generally and to all fishery commodities. Inedible by-products as well as edible fishery products are likely to feel this effect.

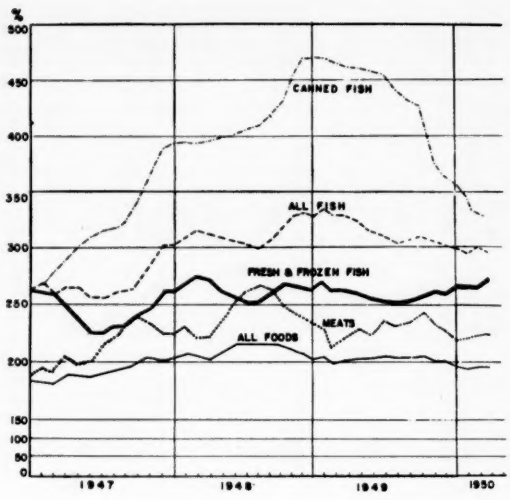
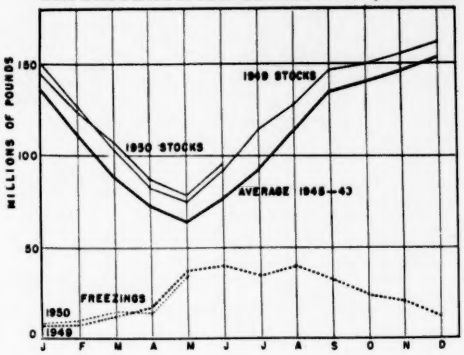


Chart I. (Left) Retail price indexes of selected foods by months, 1947 to April 1950. Base period 1935-1939.

Chart II. (Below) Production and holdings of frozen fish and shellfish, 1949 to date and five-year average.

—Data from Bureau of Labor Statistics, U. S. Dept. of Labor



holdings for all edible fishery commodities, it is usually the low point for the total and for many of the individual products.

Holdings Increase

This year the total cold storage holdings of nearly 80 million pounds of frozen fishery products on May 1 were about 4 percent larger than those of a year earlier and about one-fifth larger than the 5-year average for that date, as shown in Chart 2 on the following page. Stocks in cold storage were, moreover, larger than on any previous May 1. If cured fish are taken into account also, then the total of cured and frozen fish was about 95 million pounds, about 7 percent larger than a year earlier, and about 15 percent above the 5-year average for May 1.

In Canada, cold storage holdings on May 1 were only about two-thirds as large as a year earlier, while in Newfoundland the 2½ million pounds in cold storage was about half the amount reported for May 1, 1949. In the Canadian storage holdings of nearly 17 million pounds, fresh-water fish were only about 1½ million pounds as against nearly 7 million pounds a year earlier, while the holdings of salt-water species were over 15 million pounds and only about 3 million pounds below those of May 1, 1949.

Stocks of salt-water fish in cold storage in the United States and Alaska on May 1 were nearly 58 million pounds. This volume was some 3½ percent above the holdings of salt-water fish on May 1, 1949 and nearly one-fifth larger than the 5-year average for holdings on that date. The cold storage holdings of fresh-water fish on May 1 were about 4.7 million pounds, which was about one-third less than the holdings of fresh-water fish on May 1, 1949 and about one-fourth smaller than the 5-year average for that date. Cold storage stocks of shellfish on May 1 were about 15½ million pounds, about one-third larger than the holdings of frozen shellfish of a year earlier and about two-thirds larger than the 5-year average of frozen shellfish stocks for that date. Cured fish in cold storage totaled nearly 16 million pounds and were more than one-quarter larger than similar holdings on May 1, 1949, but were slightly less than the 5-year average of stocks of cured fish on that date.

Among the items of cold stocks which were held in largest volume on May 1, 1950, were shrimp, whiting rosefish (ocean perch) fillets, cod fillets, salmon, haddock fillets and sablefish, which together made up more than half the total stocks. Other major items were halibut, spiny lobster tails, swordfish, sea herring and pollock fillets.

Greatest increases in holdings over those of a year ago were reported for whiting, shrimp, rosefish (ocean perch) fillets, and spiny lobster tails, though significant increases were also shown in sablefish, salmon, swordfish, and sea trout. Greatest decreases in holdings as compared with those of a year earlier were in haddock fillets, flounder, fillets, pollock fillets, scallops, smelt, and cod fillets. Noticeable decreases were shown for some of the major fresh-water species, among them blue and sauger pike, chubs, lake herring, yellow pike, and yellow perch.

By June 1, the volume of cold storage holdings of fishery products had increased nearly 18 million pounds or to about the same extent as during May of 1949. However, the level of holdings on both dates in 1950 was nearly 4½ million pounds higher, or about 5 percent above the levels of 1949 and about one-fourth larger than the 5-year average stocks on those dates. Holdings of salt-water fish were almost the same as those of a year earlier, but more than one-tenth above the 5-year average for June 1. Stocks of fresh-water fish were about one-third less than on June 1 ,1949 and slightly below the 5-year average for that date. Holdings of shellfish were about one-half larger than a year earlier and about double the 5-year average for June 1.

Shrimp Holdings

On June 1, shrimp holdings were still increasing and stood at over 15 million pounds, while whiting holdings were still decreasing. Holdings of rosefish fillets and cod fillets were increasing, but salmon holdings were still dropping, and stocks of sablefish showed little change. Halibut holdings were probably about half-way to their maximum and totaled over 13 million pounds. Holdings of spiny lobster tails were still increasing. Larger holdings than those of a year earlier continued to be shown in shrimp, rosefish fillets, whiting,

swordfish, sablefish, spiny lobster tails, and sea trout, although not in salmon. Decreases were still apparent in fillets of haddock, flounder and pollock, as compared with holdings of a year earlier, though holdings of the first two increased during May. Among fresh-water species, blue and sauger pike, lake herring and yellow pike showed the most significant decreases as compared with holdings of June 1, 1949.

Imports and Exports

An examination of the import and export statistics for fishery products as a whole during the period January through March, for which the most recent complete data are available, reveals the following situation. As regards exports of edible fishery products, the total was over 15 million pounds or about one-third less than those for the same three-month period of last year, which totaled nearly 23 million pounds. Exports were less in every major class of fishery products, that is, in fresh and frozen fish and shellfish, cured fishery products and canned fishery products.

Imports of edible fishery products for the first three months of the year were over 15 percent larger in 1950 than in 1949, having risen from about 107 million pounds to over 122 million. Fresh and frozen fish imports were up more than 15 percent while fresh and frozen shellfish had increased over 10 percent, as compared with the corresponding period in 1949. Cured fish imports had increased about one-fifth and those of canned fishery products as a whole somewhat over one-tenth. Canned shellfish, however, nearly tripled in volume of imports because of an increase in canned crab meat, but the total was less than 2 million pounds.

Commodities entering into our foreign fishery trade other than those mentioned above are chiefly fish meal and fish oil. There were no exports of fish meal reported and the data on fish liver oils are not adequate to portray the situation. However, imports of fish liver oils in January and February totaled nearly four million pounds. Exports of some 1½ million gallons of fish oils in the first three months of 1950 were about one-fourth less than those of the first quarter of 1949. Data on imports of fish meal are available for the first four months of 1950 and indicate that the volume was about 21,000 tons or some 10 percent less than in the corresponding period of 1949.

T.R.R.F. Announces Regional Training Conference, Newark, N. J., Sept. 18-21

THE Refrigeration Research Foundation, the research-sponsoring organization supported by refrigerated warehousing companies and directed by H. C. "Dutch" Diehl, will hold its 11th regional training conference at the Robert Treat Hotel in Newark, N. J., September 18-21.

The latest developments in refrigeration technology, as well as the latest of modern management practices, will be discussed by conferees during the four days. Discussion leaders will be both industry and research men, as in previous regional conferences. The September meeting will attract management personnel from refrigerated storage companies in the North Atlantic States.

Discussion Sessions

A new feature will be collaboration by the National Association of Refrigerated Warehouses, through sponsorship by its Executive Vice President, William Dalton, of several discussion sessions on public and employee relations and management. This added subject matter is expected to add much of interest and value to the regular program of reviews of special commodity refrigeration technology and engineering problems.

Previous regional training conferences have covered most of the major regions of the United States and western Canada. The Foundation conducted its first training conference in Hershey, Pa., in September, 1946. In these conferences about a dozen subjects are considered in sessions covering four days. The objective is review of technical progress and exchange of information through discussion under the leadership of highly qualified people from industry and research institutions.

Subjects and Leaders

The subjects and leaders for the North Atlanta Meeting in Newark will be as follows:

In charge: H. C. Diehl, Director and Secretary, the Refrigeration Research Foundation, and William Dalton, Executive Vice President, National Association of Refrigerated Warehouses.

Discussion leaders so far invited include: James Gallery, Quincy Market Cold Stge. & Whse. Co., Boston, Materials Handling; P. B. Christensen, Merchants Refrigerating Co., New York, Temperature & Humidity; Paul Vollmer, Produce Terminal Cold Storage Co., Chicago, Poultry & Eggs; R. A. Perry, Hygeia Co., Elmira, N. Y., Dairy Products; W. T. Pentzer, USDA, Beltsville, Md., Fruits & Vegetables; James Wiant, USDA, New York, Citrus; J. G. Woodroof, Georgia Experiment Station, Candy & Nuts; J. M. Lemon, U. S. Fish and Wildlife Service, Seafoods; R. M. Smock, Cornell University, Ithaca, Air Purification; W. L. Mallman, Michigan State College, Sanitization.

Training for Retailers of Poultry and Eggs

IMPROVING the merchandising of poultry and eggs is the object of a program for retailers and their employees, the U. S. Department of Agriculture has announced. Intensive training will be conducted by the Poultry and Egg National Board of Chicago, operating under a contract with the Department. The work will be done with Research and Marketing Act funds, under supervision of the Poultry Branch, Production and Marketing Administration.

Demonstrations for retailers and their employees will include recommended methods of preparing, displaying, and maintaining the quality of eggs, poultry meat, and other poultry products in retail stores, as well as methods of buying, storing, pricing, and record-keeping.

The program is of an experimental nature, and is designed to determine whether retailers adopt the recommended practices, and how much the adoption increases volume and reduces losses, deterioration, and costs. Other aims are increased consumer satisfaction with poultry products and development of methods that will help to move abundant supplies of poultry products.

Missouri Valley Chapter

AT THE quarterly meeting of the Missouri Valley Chapter, National Association of Refrigerated Warehouses, held June 15 at St. Joseph, Mo., James Wilkerson, Empire Storage & Ice Co., Kansas City, was elected chairman; George M. Brown, Wichita Ice & Cold Storage Co., Wichita, Kans., vice chairman and Walter H. Rathert, Chouteau Avenue Crystal Ice & Cold Storage Co., St. Louis, treasurer. A. F. Versen, St. Louis, was re-elected secretary.

Dalton Heads Food Group

AT THEIR regular monthly July meeting in Washington, 75 trade association executives in the food field, members of an organization known as The Food Group, elected William Dalton, Executive Vice President of the National Association of Refrigerated Warehouses and General Secretary of the American Warehousemen's Association, as their presiding officer for the coming year. Dalton succeeds Raymond E. Steele, General Counsel of the National Fisheries Institute, who guided the affairs of The Food Group during its first year of activity.

His business life having been spent principally in the food field, Dalton has operated both as a retail distributor and as owner of a food manufacturing concern. Prior to joining the NARW in 1948, Dalton was in charge of activities of the National Association of Manufacturers in the south, with headquarters in Atlanta.

The Food Group was organized to provide an informal sounding board for problems affecting the food field generally. In coming months, national defense planning as it affects the nation's food industries will be a topic of primary concern.

Other officers of The Food Group are: Joe R. Cavanagh, American Institute of Food Distribution, Vice Chairman; Miss Geraldine Walsh, Milk Industry Foundation, Secretary-Treasurer.

Apples Can be Dehydrofrozen

DEHYDROFREEZING—a new food-processing technique that reduces weight and volume of product and also simplifies handling and use in other respects—has proved highly suitable for many leading varieties of Western apples in studies at the Western Regional Research Laboratory.

The dehydrofrozen slices are attractive, not shriveled or misshaped, and have no "dried-apple" appearance. They are permanently protected against darkening by only 20-40 ppm. of sulfur dioxide (fresh-weight basis). They can be thawed and held at 75 F. for several days or for a week or longer at 32 F. Thawing of 30-lb. cans requires only a few hours and thawed slices do not "leak."

Absence of leakage would be a considerable advantage to bakers. In reconstitution for pie filling, a short period of soaking (about one hour) is sufficient. A direct cook, with all pie-filling ingredients, of less than 5 minutes is also satisfactory. The flavor and texture of dehydrofrozen apples, evaluated in pies; are similar to those of fresh apples. Partial dehydration requires only a short time at moderate temperatures. Freezing and packaging costs, by conventional methods, are of course considerably reduced as compared with ordinary freezing. Fifty to 60 pounds (fresh-slice basis) of the partially dried slices can be packed into a 30-lb. can prior to freezing.

'Safety-Graph' on Materials Handling Equipment

PROMOTION of industrial safety measures in the refrigerated warehousing industry has been recently implemented by use of a National Safety Council "Safety-Graph" on power truck operation.

Purchased by the National Association of Refrigerated Warehouses, the Safety-Graph is circulated among the membership on a library-loan basis. It has been in constant use since its acquisition several months ago.

Consisting of an illustrated lecture on the proper use of power driven equipment employed in materials handling, the Safety-Graph is widely acclaimed for its practical value in plant safety programs.

Cartoon-style drawings are designed to complement a text printed on the reverse side of each page of the Safety-Graph. Personnel concerned with power truck operation are assembled in small groups and the lecture is read to them by a group leader while they scrutinize the accompanying drawings.

Considerable interest has been displayed in the project by allied industries and publications representing them. The Safety-Graph service is offered free of charge to NARW members. It is but one of a number of similar benefits to which members are entitled.

N.A.R.W. First Annual Statistical Survey

THE National Association of Refrigerated Warehouses has embarked upon a major industrial project to secure authentic statistical data as to the extent of operations of the refrigerated warehousing industry. Confidential questionnaires have been mailed from association headquarters and it is hoped the response will be as near 100 percent as it is humanly possible to make it.

Emphasis is placed on the method of assuring the strictest confidence in handling the returned questionnaires. Under no circumstances, according to executive vice-president William Dalton, will the information be used in any way which will reveal individual plant or company figures.

The survey is being conducted to enable N.A.R.W. to speak more effectively and authoritatively for the industry in terms of facts and figures when required. Industry statistics are a vital necessity from the standpoint of good public relations and especially in contacts with government bureaus.

Convening for their second quarterly meeting of 1950, members of the Executive Committee, National Association of Refrigerated Warehouses, met in Omaha, Nebr., on May 16-17. Standing, left to right, they are: Walter A. Kopke, Chicago; William Dalton, Washington, D. C.; E. E. Seymour, Detroit; H. A. Gross, St. Louis; A. B. Efroymson, Cleveland; Julius Gagini, N.A.R.W. president, Omaha. Bottom, left to right: Nonmember William Maus, host to the group during a tour of Boystown; Wm. A. Moore, New Orleans; H. C. Emerson, Bridgeton, N. J.; J. P. Johnson, Washington; C. B. Hart, Tacoma; C. E. Simmon, Oklahoma City.

JULY 1 COLD STORAGE HOLDINGS

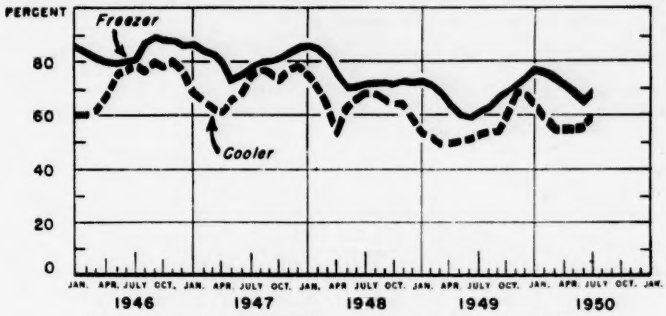
PUBLIC cooler space utilization on July 1 was 60 percent—up 4 points from a month earlier. This rise in cooler occupancy compares with an average 2 point increase reported during the 5-year period ended July 1, 1949. Although public cooler occupancy was still below average for this time of the year, the present level was 8 percentage points above the occupancy level reported a year ago. In the following states—Indiana, Wisconsin, Minnesota, the Dakotas, Kansas, the Carolinas, Georgia, Tennessee, and Oklahoma—coolers were utilized to near capacity as occupancy of 80 percent or better was reported in each of the states.

Public freezer occupancy likewise increased during June and by July 1 reached 69 percent—an increase of 5 points. July 1 public freezer occupancy was only 4 points below average but 8 points above the corresponding month a year ago. Moderate increases in freezer occupancy were reported in most states, but the largest increase since last month was reported in Oregon where occupancy in freezer space increased from 36 to 67 percent. A 9 point increase since last month was reported by warehousemen in Illinois, Iowa, and Arkansas. Refrigerated storage space was filled to near capacity in Minneapolis, St. Louis, Kansas City, Baltimore, Nashville, and Memphis. In the aforementioned cities both coolers and freezers were reported to be 80 percent occupied or better.

National holdings of foodstuffs under refrigeration totaled 2.9 billion pounds on July 1. Cooler commodities totaled 1.3 billion pounds, slightly less than average for this time of year but 152 million pounds greater than total weight in coolers on July 1, 1949. During June, there was a 4 percent increase in cooler-held commodities because of the seasonal increases in holdings of dried, and evaporated fruits, cheese, nuts and nutmeats, shell and dried eggs, and selected meat and meat products. Freezer-held commodities amounted to 1.6 billion pounds—or 6 percent greater than last month. Commodities held in freezer storage, total weight, was above average and the stocks of a year ago by 156 and 248 million pounds, respectively. Except for poultry and selected meat items, stocks of all other freezer-held commodities increased during June. The net increase was 92 million pounds.

National holdings of miscellaneous fresh fruits, dried and evaporated fruits, potatoes, and onions were all below average for this time of year. Nutmeats, all kinds, totaled 84 million pounds; nuts in shell, all kinds, amounted to 39 million pounds. Frozen fruit stocks up 47 million pounds since June 1—the average increase for this time of year is 17 million pounds—totaled 334 million pounds on the first of this month for an all time July 1 high. Less than average amounts of frozen vegetables moved into storage during June. The 15 million pounds net increase which brought total on hand to 236 million pounds compares with an average increase of 24 million pounds and the net into storage movement of 33 million pounds during June 1949.

A net into-storage movement of 46



Occupancy of public cold storage warehouses, 1946-1950

TABLE I—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	July 1, 1950	June 1, 1950	July 1, 1949	Five-year Average
Meat and meat products, lbs.	632,687	673,868	612,391	629,861
Lard and rendered pork fat, lbs.	134,708	128,467	103,890	112,259
Frozen poultry, lbs.	122,701	136,548	74,733	123,324
Creamery butter, lbs.	182,479	136,867	102,701	77,743
American cheese, lbs.	228,574	186,062	140,859	137,690
Other cheese, lbs.	21,635	19,287	19,253	22,441
Shell eggs, cases	3,696	3,412	2,290	5,631
Frozen eggs, lbs.	187,744	179,732	166,582	238,323
Apples, bu.	147	1,289	343	...
Frozen fruits, lbs.	334,208	287,445	255,787	267,205
Frozen vegetables, lbs.	235,665	221,119	219,515	183,892
Frozen fish, lbs.	113,727	97,773	114,031	92,194

TABLE II—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu. ft.)		July 1, 1950 (%)		June 1, 1950 (%)		July 1, 1949 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	2,920	5,314	45	69	47	65	45	74	66	66
Middle Atlantic	38,417	28,613	47	64	46	61	43	57	61	74
East North Central	27,594	28,317	75	68	61	61	63	60	74	70
West North Central	10,293	14,631	81	86	80	82	59	64	76	75
South Atlantic	8,563	5,643	66	75	61	73	53	72	72	78
East South Central	4,351	3,974	83	90	82	89	65	84	82	82
West South Central	7,738	7,337	62	59	62	59	65	51	76	74
Mountain	1,649	1,991	65	65	79	65	55	64	74	76
Pacific	14,987	19,568	44	63	41	55	37	59	52	70
United States	116,512	115,388	60	69	56	64	52	61	67	73

TABLE III—PERCENTAGE OF SPACE OCCUPIED BY PRIVATE AND SEMI-PRIVATE REFRIGERATED WAREHOUSES AND MEAT PACKING PLANTS (APPLE HOUSES EXCLUDED)

	Private and Semi-Private Warehouses						Meat Packing Establishments					
	Net Piling Space (000 Cu. Ft.)		Space Occupied—Per Cent				Net Piling Space (000 Cu. Ft.)		Space Occupied			
			July 1, 1950		June 1, 1950				July 1, 1950		June 1, 1950	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	85	106	50	74	35	62	.....	.....	..	..	..	..
Middle Atlantic	1,049	1,014	50	74	35	72	1,642	284	86	85	85	80
East North Central	3,045	1,605	62	40	57	36	5,831	2,078	84	68	88	81
West North Central	585	2,221	91	48	94	77	14,573	6,099	85	83	88	83
South Atlantic	361	185	..	63	..	38	959	229	86	100	82	100
East South Central	.....	.....	..	..	..	..	403	100	87	91	85	89
West South Central	234	73	42	55	37	55	2,525	501	100	100	100	100
Mountain	.....	.....	..	..	..	..	422	366	100	100	94	98
Pacific	3,775	2,838	46	45	13	42	2,662	489	98	94	94	95
United States	9,134	8,042	53	56	44	54	29,017	10,146	88	83	90	85

NOTE: Blank spaces indicate that insufficient returns were received.

million pounds of butter brought July 1 stocks to 182 million pounds—a record high for this time of year. The increase in butter stocks during June was, however, about average but was below the increase of a year ago when 52 million pounds moved into storage during June.

Cheese stocks increased by about a third greater than average and was two-thirds greater than the increase of a year ago.

Illinois led all other States in the storage of shell eggs. Out of 3.7 million cases of shell eggs in storage on July 1, more than a third—1.3 million cases—were in Illinois storages. National holdings of shell eggs increased during June by 300 thousand cases which compares with 700 thousand cases moved into storage during the 5-year period ended July 1, 1949. Frozen egg holdings on July 1 were up 188 million pounds—an increase of 8 million pounds since last month.

Withdrawals of frozen poultry during June, about average, brought total stocks down to 123 million pounds, which was about equal to the 5-year average July 1 stocks.

During June, beef, pork, and other meat items were withdrawn from storage in greater than average amounts. Net withdrawals of 11 million pounds of beef left 61 million pounds on hand July 1. This compares with 75 million pounds in store last year and average July 1 stocks of 119 million pounds.

Fishery products in storage, frozen and cured, amounted to 137 million pounds on July 1—an increase of 20 million pounds since last month. Of the total in storage frozen fishery products amounted to 114 million pounds which reflected a seasonal increase of 16 million pounds.

Storage Outlook

The increase in public cooler occupancy during June was twice the average increase for this time of year. This is partially accounted for by the greater than average in-movement of stocks of cheese, dried eggs and nuts and nut-meats. Although cheese holding on July 1 were the second highest on record it is expected that the in-movement of this commodity will continue, since peak storage is generally not reached until September or October. If stocks of the above mentioned commoditites continue to move into storage in above normal amounts, occupancy should continue its greater than average increase, but in any event, the normal pattern indicates an increase of at least 1 or 2 points can be expected during July.

Freezer occupancy of 69 percent on July 1 was a 5 point increase over the previous month, whereas the average increase during this period was 3 points. Although an increase in freezer occupancy is expected during July the extent of the increase depends a great deal on the in-movement of frozen fruits which already have shown signs of increasing in greater than average amounts. A normal increase would raise occupancy 3 points to 72 percent on August 1, which would be 4 points below the 5-year average occupancy.

Cold Storage Stocks of Frozen Fruits and Vegetables

THE percentage of frozen strawberries stored in retail containers dropped from 25 percent on May 1 to 16 percent on June 1, indicating that most of the strawberries which moved into storage during May were in institutional-sized containers. Of the 27 million pounds of strawberries classified as to container size, only 4 million pounds were reported by warehousemen as being in packages of one pound or less. This was next to a record low in the proportion of strawberries in consumer packages. On June 1, 1948, 13 percent were reported as being in this type container. Peaches also showed a decrease in the ratio of retail to institutional-sized containers with 35 percent of the stocks of classified peaches in consumer-sized packages on June 1 in comparison with 39 percent reported May 1. Packaged stocks of raspberries remained about the same, proportionately, as last month. Reports received on container sizes covered 68 percent of the total stocks of the selected fruit items, a decrease of 3 points from the percentage reported last month. Coverage on strawberries increased 6 percentage points, while the amount of raspberries classified dropped 7 points and peaches dropped 4 points.

COLD STORAGE STOCKS OF FROZEN FRUITS AND VEGETABLES IN PACKAGES OF ONE POUND OR LESS IN STORAGE JUNE 1 AND MAY 1, 1950 (000 LBS.)

	June 1, 1950		May 1, 1950	
	Lbs.	Pct.	Lbs.	Pct.
Peaches	2,250	35	3,051	39
Raspberries	1,685	16	2,075	15
Strawberries	4,414	16	1,672	25
Asparagus	2,134	63	973	64
Beans, lima	8,563	48	11,213	51
Beans, snap	6,705	64	8,361	67
Corn, sweet	5,308	49	6,040	45
Peas, green	10,757	58	14,091	57
Spinach	11,677	75	12,645	76

Fifty-five percent of June 1 holdings of the six selected vegetable items were classified as to container size. This compares with a coverage of from 59 to 61 percent each month since last June 1; only 52 percent of stocks were reported according to package size a year ago. The ratio of consumer to larger-sized packages, however, remained approximately the same as it has been for the past several months, with 59 percent of the vegetables reported as being in packages of one pound or less. Proportionately, more of the corn and green peas were reported in retail containers on June 1 than last month. The remaining vegetables showed a decrease in the ratio of consumer to institutional-sized packages with lima and snap beans each dropping 3 percentage points and asparagus and spinach decreasing 1 point.

Cold Storage Study on Gravenstein Apple

University of California Findings Indicate Advantages of Cold Storage to Prolong Marketable Life.

A BULLETIN has been issued by the California Experiment Station, Davis, Calif., on storage tests made on Gravenstein apples in an attempt to lengthen their marketable life, written by F. W. Allen, professor of Pomology and Enoch Torpen, farm adviser, Sonoma County.

The apples were placed in cold storage for a period of about four months and changes that would affect their market value were checked and recorded periodically. Some of the apples were subjected to further tests to determine their shipping possibilities and their value for processing. The findings although not conclusive on all points, indicate the advantages of cold storage in prolonging the marketable life of Gravensteins.

The problem was how to lengthen the salable life of Gravenstein apples. Gravenstein growers felt that the relatively short period during which their fruit could be sold, either as fresh fruit or for processing, was a serious handicap. For the most part, they had to sell as the fruit was harvested, or take a loss from spoilage. And so a group of growers asked the University of California to conduct some tests to determine to what extent cold storage would solve the problem.

Tests were made on 200 boxes of Gravensteins from Sonoma County. The apples were stored at 32 F. for periods ranging up to 120 days. A few of the apples were given artificial atmospheres (under laboratory conditions). After two months' storage period some of the apples were subjected to simulated shipping conditions of ten to twelve days duration. At this time, and also later, other lots of apples were made into sauce which was tested and graded.

The Findings

Cold storage will help to lengthen the salable life of Gravensteins, but there are certain limiting factors involved, chief among which are:

1—Bitter pit, which may develop within a few weeks after storage.

2—Scald.

3—Deterioration in flavor, which develops after 2½ to 3 months.

4—Overripeness and breakdown in the flesh, which takes place after 100 to 120 days.

These troubles were not always definitely correlated in the fruit from any one orchard, but in general this appeared to be the case. Apples from two or three of the orchards developing the highest percentage of bitter pit, also showed the most scald and breakdown. Conversely, three orchards showing little bitter pit development were low in the other troubles.

Fruit from different orchards seemed to have inherent differences in keeping quality. These differences may have been due to variations in cultural practices by growers, but this phase was not studied in the tests. The primary influencing factors which were studied are:

1—Maturity of fruit at harvest.

2—The time interval between picking and storing.

3—The length of the storage period.

4—Size and color of fruit.

The most desirable fruit for storage purposes was fruit harvested at midseason. Fruit harvested late in the season and stored without delay was next most desirable. Buit fruit picked early in the season should not be stored for future use.

Large sized fruit developed more bitter pit and breakdown than smaller fruit and had inferior storage qualities. Little difference was found in the keeping quality of small and medium sized fruit.

Bitter pit was most prevalent in early harvested and in large sized apples.

Scald was worse on early picked fruit. Highly colored apples, those with red stripes, were less susceptible to scald than green colored fruit.

Breakdown was associated with large fruit, delay in cooling, and late picking.

Storage Possibilities

For the fresh market, apples should be removed from storage sufficiently early to be sold while still sound and attractive. For the California market this means they should not be held over two or three months; for the eastern market, they should not be held longer than two months.

For processing, where the fruit is used immediately after being taken from storage, and where appearance and a slight amount of bitter pit is not important, some Gravensteins may be stored up to four months.

The tests showed, however, that fruit from some orchards should not be held longer than half of the above periods.

Sauce made from Gravensteins stored for two to four months or more, while not considered equal in quality to that made from fresh apples, was nevertheless considered of standard grade, the quality of most sauce made in the district from which the apples were taken.

Apples showing scald, and considerable bitter pit, if not too deep seated, may be acceptable for processing into applesauce.

Preliminary results from storing Gravensteins in artificial atmospheres, under laboratory conditions, indicate that color and softening may be materially retarded, and that storage life may be extended 50 percent or more. The artificial atmospheres, however, did not retard flavor deterioration. Both aroma and flavor appear to be lost as quickly, or even more quickly than is the case when the fruit is stored in normal air.

Recommendations

In the California markets, buyers of fresh fruits (particularly consumers) make their purchases largely on the basis of appearance, so the apples should be attractive as well as good.

These requirements demand that the apples be removed from storage and placed on sale before storage troubles make their appearance. If this is not done, all specimens showing any type of storage trouble should be sorted out. In either case, fruit offered for sale should still be firm, bright, sound, and of good appearance. It must still have sufficient storage life to remain in marketable condition for the time it will be exposed to higher air temperatures, possibly two weeks.

For this reason as well as economic

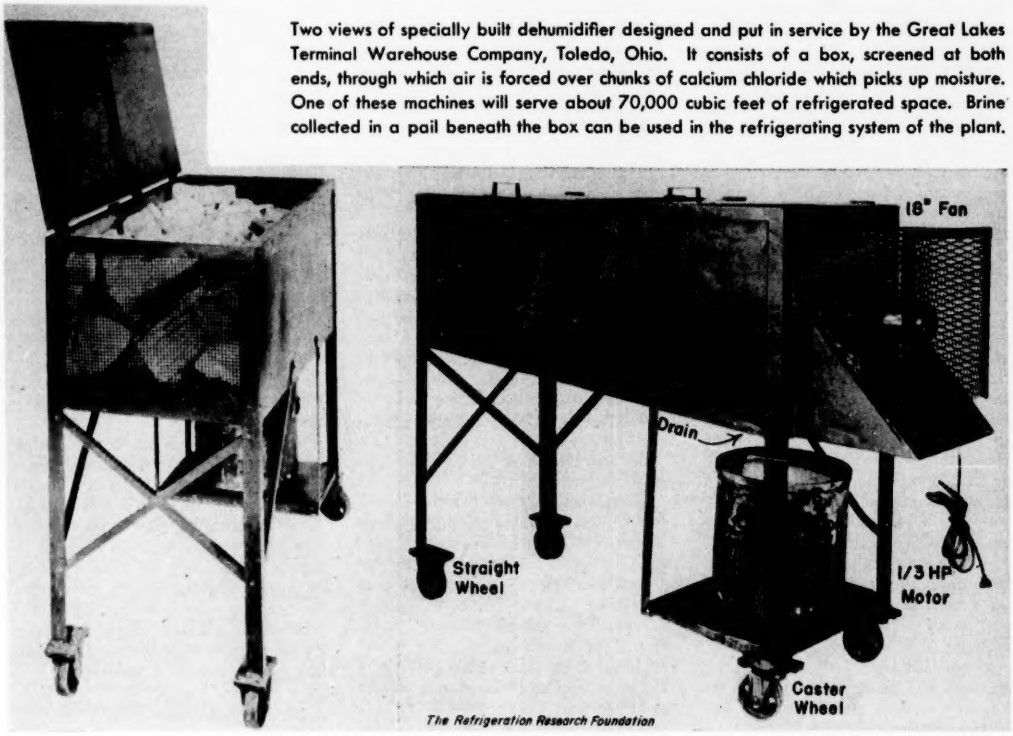
ones, commercial storage of Gravenstein apples for fresh fruit sale should end before any considerable percentage of specimens show shriveling, bitter pit, scald, or breakdown.

On the eastern market, wholesale receivers are critical of any fruit showing much ripening and fruit which might meet ready sale in California markets would probably be called "overripe" on eastern markets.

Where a portion of the stored crop may be selected out, packed and shipped to eastern markets, the storage period should be from one-half to two-thirds that of fruit for local markets. If the apples are packed prior to storage, and then shipped with minimum exposure to normal air temperature in loading, comparatively little ripening will occur in transit. Some lots of such fruit, however, may after only several weeks,

(Continued on page 58)

Dehumidifier for Refrigerated Storage Uses Calcium Chloride



Two views of specially built dehumidifier designed and put in service by the Great Lakes Terminal Warehouse Company, Toledo, Ohio. It consists of a box, screened at both ends, through which air is forced over chunks of calcium chloride which picks up moisture. One of these machines will serve about 70,000 cubic feet of refrigerated space. Brine collected in a pail beneath the box can be used in the refrigerating system of the plant.

A DEHUMIDIFIER for refrigerated warehouse storage has been designed by L. M. Ashenbrenner of the Great Lakes Terminal Warehouse Co., Toledo, Ohio. An illustrated description was published in a recent Bulletin of The Refrigeration Research Foundation.

Essentially this equipment is a box, screened at both ends, through which air is forced so that it is blown over chunks of calcium chloride, which picks up moisture. The fan is firmly mounted in one end and protected by a screen. Both ends are screened to hold the chunks of chloride and allow the blast to pass through. The floor is sloped so that drainage of liquefied chloride is toward a drain, under which a 15-gallon pail collects the liquid. Straight wheels on one end and caster wheels on the other permit easy movement. The drain hole over the liquid brine container should be at least one inch in diameter and a larger one is better to prevent stoppage, especially if the calcium chloride solidifies.

Specifications and other details of this device are given as follows:

Materials & Equipment: Galvanized metal to resist corrosion—angle-iron on corners extending from top of body to casters. 5-inch wheels, the larger the better. 18-inch whirlwind exhaust fan with bucket-type blades. About ⅓ hp motor with two speeds, will handle about 3,000 cubic feet per minute, 60-cycle, single phase, suitable for regular socket plug-in.

Size: Can be made any size. Size shown will hold about half a drum or 350 lbs. of large-chunk calcium cholride. (Flake or brick type solidifies too rapidly.)

Performance: Much depends on humidity in room. One machine will serve about 70,000 cubic feet but two may be needed. Economical since the brine collected in the pails can be used in refrigerating system.

Drying Agent: Use only calcium chloride solids, not flake or brick type. The solids are large chunks which permit better air movement through the unit. The flake or brick calcium chloride solidifies too rapidly into a mass and is not as effective. The calcium chloride brine obtained from the humidifier drip may be used in the sprinkler or refrigerating system, if brine is used as a secondary refrigerant.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Howard Peterson, Yakima, Wash.
First vice-president, National Association Practical Refrigerating Engineers

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Adjusting Multiple Rooms for Best Operation

THE matter of refrigerating several cold rooms under direct expansion with one compressor comes up frequently. If the plant is fairly large and somewhat diversified as to load, the problem is not too difficult. On smaller plants there may be several problems including short cycling of the compressor. Recently the assistance of an N.A.P.R.E. member was requested on a problem of this type, and he sent his discussion to the national office.

Basically the question was as follows:

"We have three cold storage rooms operating at 33 to 38 F on one condensing unit. Each coil is fed by a thermal expansion valve, and there is a magnetic stop valve before each thermal expansion valve. Each of the three magnetic stop valves is operated by its own room thermostat and the wiring is arranged so that the condensing unit motor stops whenever all three magnetic stop valves are closed. The condensing unit motor starts again whenever any one of the magnetic stop valves is opened. How is it possible to prevent short-cycling of the condensing unit when two rooms are down to temperature but one is not?"

Originally it was stated that the three rooms should be held at 33, 35 and 38 F respectively but actually mention of these specific temperatures is quite irrelevant and merely serves to complicate an otherwise simple question. For all practical purposes it doesn't make any difference whether the temperature in any room is 33 F or 38 F. The user will be unable to detect any difference in the produce he handles as long as the temperatures are held somewhere between those thermometer marks, or even that they are held anywhere in that range. Sometimes we fool ourselves by striving in a commercial type of installation to obtain close control more suited to laboratory operation.

The solution to the problem requires some time and attention but once the procedure has been completed, good operation will result. Then as time goes on only minor adjustments will be needed to maintain the situation.

Compressor Capacity and Coil Surface

(1) When only one evaporating coil is feeding there is a condition involving too much compressor capacity and not enough coil surface. To adjust discard any ideas that you may have about regulating room temperatures by means of the thermostats for the time being, in fact, ignore thermometers and temperatures completely until you have the liquid refrigerant feeds adjusted. Watch the system while the compressor is idle and about ready to start. As soon as the compressor starts, note which one of the three coils is feeding and immediately adjust the other two thermostats towards "colder" so they too will start the liquid feeding through their respective coils. Some five or ten minutes later at the time you think one or more of the magnetic stop valves are about ready to close watch for the first one to close and then immediately adjust the other two thermostats toward "warmer" so they too will close their respective magnetic stop valves causing the compressor to shut down. Continue these thermostat adjustments through several operating cycles until you are satisfied the short-cycle problem has been eliminated.

(2) After eliminating the short-cycling by proper adjustment of the thermostats, that is, when all three magnetic stop valves open and close at about the same time intervals, you may get out your thermometers again

and check the room temperatures. If any one room is too warm, adjust all three thermostats toward "colder" until the one warm room is cold enough and then watch through several operating cycles to make sure all three magnetic stop valves open and close at about the same time intervals. Adjust further in acordance with Paragraph 1 if there is any indication that the short-cycle is liable to re-appear. Do not be concerned about the temperatures in the two colder rooms at this point.

(3) After the basic adjustments outlined in Paragraph 1 and 2 have been completed, the three magnetic stop valves will open and close at about the same time, and the condensing unit will run just long enough at each cycle so that one room becomes just cold enough while the other two rooms are a trifle colder, or a great deal colder than they should be. At this point, adjustment of the thermostats has been completed and the short-cycle problem eliminated.

Room Temperatures

(4) When adjustment of the thermostats has been completed, and not until then, check the room temperatures again through several operating cycles, and note if one room is too cold. If one room is too cold, it is so because there is too much evaporating coil surface in that room. To correct for this, disconnect the thermal expansion valve operating element bulb from its location near the outlet end of the coil, and clamp it on the coil again at a point much closer to the expansion valve which will have the effect of reducing the effective surface of the coil.

(5) The system should now operate as the designer intended, and there will be little chance of short-cycling if the refrigerant charge is sufficient to frost up all the coils, and if the compressor is not too large. Of course, even though the three magnetic stop valves stay open for the same length of time there is no assurance that they will all open and shut in synchronism with each other, in fact it is conceivable that number 1 might run along by itself and then shut off just as number 2 came on and that number 2 would shut off just as number 3 came on. Under such a situation, that is with the compressor running on one-third of the coils, the suction pressure would be very low reducing the compressor capacity so that it would have to run nearly continuously and the low suction pressure would also mean a low evaporating temperature in the coil which would reduce the coil running time in proportion.

If the compressor is too large, the fact will be determined by keeping a log of the running time for a few days, checking the several liquid feeds now and then to make sure that at least two coils are in operation most of the time. In many communities the power company engineers are greatly interested in informal test runs of electrical machinery, and it is quite possible that your power company will install a recording meter of some sort from which you can determine the compressor running time for a period of time. If the compressor proves to have too much capacity, that is, if it operates only 50 per cent or less of the time in extreme weather, it should be replaced with a smaller size which will increase the efficiency on account of the higher suction pressure.

(6) If the compressor is too large (see Paragraph 5) but the owner prefers not to exchange the condensing unit for a smaller size, then he can consider adding more evaporating coils, which will prove to be an excellent investment in that the higher suction pressure resulting from the additional coils will increase the efficiency and the net savings will be quite apparent on the monthly power bills.

Too Many Controls?

(7) If there is no major fault in the design of the plant, that is, if the condensing unit is not larger than it need be, and if the coils are large enough to balance the compressor when the controls are adjusted neatly, and if short-cycling appears now and then, it would be proper to suspect that the system suffers from too many controls. If so, disconnect the wiring to the thermostat in the one room where exact temperature control is of least importance, and wire the magnetic stop valve in that room so that it will open when the compressor motor starts and shut when the compressor motor stops. The result will be that when the compressor runs it will be running on at least two coils and possibly three coils. If after a few days' operation, the uncontrolled room becomes much colder than it should be the thermal expansion valve operating element bulb may be re-located as suggested in Paragraph 4 above.

N A P R E
Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

Condenser Liquid Sub-cooling

Question No. 853: In evaporative type Freon-12 condensers the liquid is sometimes drawn off through a sub-cooling coil placed in the water collecting pan. Just how much benefit does this sub-cooling bring to the operation?—J.F.

ANSWER: For every degree of sub-cooling by a coil submerged in water there is about one-fourth of a Btu increase in refrigerating effect. A four degree sub-cooling, say from 90 to 86, benefits the refrigeration effect under most evaporating pressures less than two percent.

Example: Assume saturated Freon-12 vapor at 40 F leaving evaporator ($h = 82.71$), and 90 F. saturated liquid leaving condenser ($h = 28.70$), the refrigerating effect is 54.01 Btu. If the liquid is sub-cooled 4 degrees, $h = 27.72$ and the refrigerating effect is 54.99 Btu. This is a gain of 0.98 Btu or 1.8 percent.

Sub-cooling of the liquid might have a beneficial effect upon the rate of flow through the expansion valve, making it more uniform. Saturated liquid from the condenser would probably pick up some heat before it arrived at the expansion valve, causing it to contain a certain percent of vapor. This vapor would cause a decrease in the weight flow through the orifice of the valve.

Usually very little sub-cooling will be obtained through a coil submerged in the water collecting pan. More sub-cooling may be obtained by an exchange of heat between the suction gas and the liquid.—H. G. Venemann.

Liquid Line Vibration

Question No. 854: The liquid line of our Freon-12 system vibrates when the discharge pressure is high. The load is fairly constant and the line appears well braced. It has only

a strainer and solenoid valve between the receiver and 6 thermo expansion valves. What causes vibration in liquid lines like this? What is the best procedure to eliminate the vibration?—S.R.L.

ANSWER: The cause of vibration is often very difficult to detect. In all probability the solenoid valve is the culprit in this case. When operating with 60 cycle alternating current the frequency through the field coil of the solenoid is 120, causing a hum and under certain conditions a vibration. This is especially true if the solenoid valve or the liquid line is attached to a wooden partition wall, where a mechanical vibration is set up. I have seen cases where the noise and the vibration of a solenoid valve could be heard a block away. Try mounting the solenoid valve on a rubber padding. If the valve has no mounting other than the liquid line itself, try spring mounting or rubber at the hangers. Vibration could also be started at the compressor. The remedy would be the same. Rigid bracing of the line may not be as effective as the use of a shock absorbent.—H. G. Venemann.

Float Collapses

Question No. 855: The ball-float in a liquid level control on our large evaporator collapsed in service after only a few months operation. We discussed the matter in our meeting and no one could explain why the float collapsed inward instead of bursting outward. One member related another incident where a ball-float had completely collapsed under operating pressure in the system. What usually accounts for such failures and how can they be prevented?—R.V.C.

ANSWER: The collapse of a ball-float when used as a liquid level control in an evaporator is due to the fact that the metal was not heavy enough at all points to withstand the external pressure. I do not know the cause of failure in the case cited, but I can imagine how an 8-inch ball made of pressed steel, and welded around the circumference could have an external pressure of 6114 pounds and an internal pressure of less than 1077 pounds. With this great pressure on the outside and the much smaller pressure on the inside, the metal is under compression. Since the strength of a metal under compression is unpredictable any weak or thin spot may easily cause a collapse. This is further accentuated by the fact that in cooling, the metal contracts thus setting up additional internal stresses.

You may ask under what conditions were the above pressures derived? Let us assume that during the welding of the two halves of the ball that the temperature of the air reached 800 F (1260 absolute). This air when sealed within the sphere is at atmospheric pressure, 14.7 psia. When partly immersed in ammonia at 0 F (460 absolute), the air pressure drops to 5.36 psia, while the external pressure of the ammonia vapor is 30.42 psia. Note: At constant volume the pressure of a gas is directly proportional to its absolute temperature.

Therefore $P_2 = \frac{14.7 \times 460}{1260} = 5.36$ psia.

The outside area of an 8 inch sphere is 201 sq. in. The inside area is slightly less, depending upon the metal thickness. Therefore the total pressure on the outside is 201×30.42 or 6114 pounds, which the inside pressure resisting collapse is only 201×5.36 or 1077 pounds.

This, of course, is only one example as to why the ball-float could collapse, but in nearly all cases you are reasonable in assuming that the internal pressure of the air in the ball when immersed in a cold liquid is considerably less than when it was welded.—H. G. Venemann.

NEW QUESTIONS

Answers in September Issue

Refrigeration for Steam Condensing

Question No. 856: I have considered the idea of cooling the exhaust steam in steamship condensers by mechanical refrigeration instead of the present water circulation method. I have discussed this method with several engineers, and it is agreed by all that this method would be ideal, but all but myself think the tons of refrigeration required would be excessive. The problem is: how many tons of refrigeration would be required to condense the steam from 10,000 hp turbine with a water rate of 8 lb. steam for hp hour, 28 inches of vacuum in the condenser? The temperature of the steam as it leaves the low pressure turbine is 101 degrees Fahrenheit and a temperature of 80 degrees is desired for the condensate.

If you will give me this information in a simple form, I would appreciate it very much. I would also like to have your opinion on the feasibility of this idea.—J.S.W.

NAPRE Department

Waterproof for Ice Tank Covers

Question No. 857: For a number of years the only method of waterproofing ice tank covers found to be even fairly satisfactory has been to have them thoroughly dry and then to soak them for several hours in boiling linseed oil. A mixture of ⅔ transformer oil and ⅓ paraffin oil has been recommended as superior to linseed oil for waterproofing covers. Is there any known experience with this product, if not, what other materials are known to be satisfactory for this purpose?—H.N.R.

Discharge Gas Coolers

Question No. 858: Where head pressures are high, due to shortage of condenser or cooling tower, ammonia gas pre-coolers are sometimes used between the compressors and condensers. In many cases, heat radiating fins of metal might be installed on the discharge lines in the plant, which might be effective, especially if the discharge lines were fairly long. Such fins might give some reduction in temperatures of the ammonia gas. Do you think this would be practical? Has this ever been tried? Do you know where these fins can be purchased for use over pipe of standard size?—S.M.U.

Los Angeles Hotel to Have Complete Air Conditioning

A $3,000,000 sub-contract for providing and installing heating, ventilating, plumbing, refrigeration and pipe coverings, assigned to Mehring & Hanson of Los Angeles, Chicago and Washington, was included in contracts for construction of the $20,000,000 Statler hotel and office building which were awarded at a conference in Los Angeles June 8.

Work on the mammoth 1275 room hotel, largest constructed anywhere in the last 20 years, is to start on July 5. The Carrier Corporation has designed and will install the air-conditioning system. Centrifugal refrigeration machines will have a capacity of more than 2100 tons. An air conditioning system will enable guests to regulate the temperature to their liking by means of dial controls in each room.

The general construction contract was awarded to Robert E. McKee, General Contractor, Inc.

News Notes and Activities of Chapters

Los Angeles

BY FRED HERR

WITH Charter member J. Wesley "Wes" Lamphier, who joined the chapter away back in 1922, as local guest of honor, and with presidents C. H. Purkiss of Colton, Calif., and L. G. Schroeder of Modesto chapter as distinguished visiting dignitaries, Los Angeles Chapter held its annual Old Timers' Night in the Terminal Club June 28.

It was an evening devoted to pleasant fun and frolic and a bit of reminiscing here and there as the pioneers of west coast NAPRE, who collaborated in founding the chapter in the early 1920's, got together to tell the young members how the good old days had it all over the hectic era we are living in today. At least, that's what they said, although old-timer and young-timer alike usually agreed that, refrigeration-wise, there has been considerable progress since 1922, the year the chapter was born.

And as the ball of conversation was tossed back and forth there was heard the names of some members who were not present at this year's Old Timers Night—Howard Long of the Pure Ice Company in Culver City, who died just five days before the night of the meeting, and Mortimer E. Bell, who won a measure of distinction during the past year by becoming one of the few men who ever voluntarily moved away from Southern California. The usual movement is to Southern California, but Bell reversed the order by moving up to Seattle and into an important engineering job with the Sick Brewing Co.

Included among the 80 odd members and guests who attended were eight past-presidents, including national president E. T. Quinn who wielded the gavel of presiding officer over Los Angeles chapter in 1933. Other past-presidents included Capt. Herbert N. Royden (1928-29), Frank R. Elliot (1936) William R. Burnett (1940), Regis Gubser (1942), Ralph Moore (1947), Donald H. Byl (1948), Rudi Kettler (1949) and the incumbent prexy, Dale Rycraft.

Captain Royden presided over the Old Timers Night program. He prefaced the introduction of notables with a few remarks during which he emphasized the well-known point that the NAPRE, fundamentally, is an educational society, and that a member usually will get out of the organization benefits in direct ratio to the amount of work and time he devotes to the association. He urged the younger members to make a habit of regular attendance at meetings, for the full benefit of the technical speeches given at the semi-monthly meetings can only be obtained if all, or the greater portion of them, are heard in the sequence in which they are scheduled.

Captain Royden then introduced the presidents of Colton and Modesto chapters and called upon Messrs. Purkiss and Schroeder for a few remarks. He also introduced a number of men who, by virtue of their long membership in the chapter, have earned the title of "old timer." Among those so introduced were Mr. Lamphier, John Berger, Howard Benson, Walter Perry, P. J. Montane, Charles Rush and a number of others.

A short business session preceded the Old Timers' celebration. Mr. Burnett reported that 46 new members had been signed up. Thirty-six of these were brought into the fold by the Independents team and ten by the ice company teams. To encourage continuation of the membership drive at an unabated pace during the summer months, when no meetings are held, Mr. Burnett announced that a special prize is to be offered for those bringing in five new members during the vacation period.

Rudie Kettler and Frank Hooper reported on the barracuda expeditions which have engaged the interest of piscatorially inclined members for some months past. Rudie declared the first chartered boat trip, held in June, was an unqualified success, with 58 bass to show for the days work of some 16 fishermen. A second trip is scheduled in August which, Mr. Hooper reported, has been completely sold out.

Capt. Royden advised the chapter that Howard E. Long of the Pure Ice Company, had passed away on June 23 as the result of injuries received when he was crushed in a crane accident at the plant. President Rycraft asked all present at the meeting to stand a minute in silence in memory of the departed member.

In keeping with the theme of the evening, the committee which arranged the Old Timers Night program, delighted the membership with

Yakima Chapter invited the owners and managers of local refrigeration plants to attend their meeting and hear the national secretary tell about the educational program of the N.A.P.R.E. A dinner which preceded the meeting was concluded with a local feature—pie made with Yakima Valley apples. That accounts for the pleasant smiles everyone had in the photo.

several old-time Keystone Komedy movies. Also shown were two 16 mm. films entitled America, The Beautiful. The evening was rounded off with a buffet lunch of sandwiches and liquid refreshments, with Victor Stubblefield of the Pacific Fruit Express serving as chef.

Los Angeles Chapter will hold no meetings during July and August. Regular meetings will be resumed early in September, starting with the annual Ham-and-Beans dinner at P.F.E. Hall. The committee in charge of arrangements for the national convention will, however, get no vacation, and has various meetings scheduled during the summer for discussion of matters pertaining to the November conclave at the Hollywood Roosevelt Hotel.

Pittsburgh

By Otto Knoch

The regular meeting of Pittsburgh Chapter was held at the Fort Pitt Hotel. We enjoyed a talk on condensers given by Mr. Hubb who is now installing new condensers at the Duquesne Brewing Co. An open discussion was conducted from which we obtained much valuable information. The Hubb Condenser serves a dual purpose in that it combines the functions of a cooling tower and a condenser. In operation the water is sprayed downward in a fine mist which causes the air to circulate down through the tower and the condensers. The condenser pipes in each stand are staggered, and the foul gases and air cannot be pocketed. The liquid header and the liquid drain to the receiver are arranged to provide a good open flow of the liquid and effective purging is done from the receiver.

The chapter is sending two prizes for the Pyramid of Prizes. The one is a toaster from the Westinghouse Corp., and the other is a carton of canned goods from the H. J. Heinz Co.

Plans were made to have an indoor picnic in September for the families of the members.

San Francisco

By F. H. McLaughlin, Jr.

The refrigeration class conducted by Instructors Bill Orton, Bert McKenna and Wilbur Roberts has presented excellent material of useful nature to those who have come early for the preliminary meeting. The two meetings during the month were featured by special speakers on programs which Wilbur arranged. Both proved to be most interesting.

The subject of the first meeting was "Electrical Design for Refrigeration Plants," which was presented by Lee Couch, Head, Electrical Engineers, Design Section, U. S. Army Engineers. Mr. Couch discussed a number of the questions which always face engineers when they are designing refrigerating plants. He told how to analyze the job and determine when to use synchronous motors, when and where to use converters and described their effects in the plant's power factor and load demand.

An interesting new development was described at the next meeting by Morris Guralnick, engineer consultant, who is a qualified marine architect and engineer. It is the "Probolog" used for locating leaks in pressure vessels and heat exchange equipment. When it is used, Mr. Guralnick explained, the job of locating leaks is greatly reduced and the process is considerably speeded.

Colton

By H. O. Bonter

The regular meeting was held at the Santa Fe Ice and Precooling plant in the lunch room. After a short business session President Purkiss introduced the speaker P. A. Bulot, field engineer for U. S. Electric Motors, Inc., Los Angeles. He showed a very interesting motion picture on the construction and manufacture of their line of induction motors.

On display was one of their sanitary motors. This motor designed for use in dairy, food, canning, chemical, pharmaceutical and other industries is completely enclosed. Dirt and water cannot enter it and the motor can be washed off with a hose.

A motion picture entitled "Rhapsody in Speed" showed the complete and exacting processes of parts manufacture, gauging and inspection and assembly of the motors. Featured in it were the interesting vari-drive motors which ranged from ¼ to 50 hp and provide speeds from 1 to 10,000 rpm at the power shaft.

At the conclusion of his presentation Mr. Bulot gave a very informative talk on motors and answered numerous questions on the subject. The meeting was closed with the usual lunch which everyone enjoyed.

Seattle

By Chester Bertus

O. F. Gellert of the Lewis Refrigertion Co., who is well known to the members of the chapter from the series of talks he has delivered on the practical use of the Mollier charts, is leaving for a trip to Europe. He still owns a refrigeration contracting and manufacturing business in Vienna, Austria. He thinks that some American ideas in refrigeration application could and should be transplanted to the old country, thus contributing to the prevailing tendency to assist rebuilding in Europe with American know how.

Mr. Gellert upon his return from Europe is planning to give one or two talks to the chapter on his experiences in different countries in Europe and also on refrigeration application over there.

(Continued on following page)

Well Rounded Educational Program at 1950 Convention

THE Educational Program for the 1950 Convention at Los Angeles has been in preparation since shortly after the last annual meeting. The officers and committee members at that convention recorded their suggestions at the time when such affairs were fresh in their minds. Then the methods of presentation as well as the scheduling of the various subjects were thoroughly analyzed. Ways to bring out more specific discussion by the convention attendants were evaluated.

Naturally the special quiz and question session was approved and placed on the program as an attraction of the Los Angeles meeting. Their chapter is one that has long featured these sessions which analyze members refrigeration problems and give recommendations for their solution. The Bureau of Refrigeration Information at the convention will again be headed by Regis Gubser who inaugurated the first one. He will be joined by Professor Venemann and the other Bureaucrats who have proved their ability to answer almost any question as long as it is in the field of refrigeration and allied subjects.

As usual, a number of the members with special and extensive experience in the various refrigeration applications will participate in the program. Professor Venemann, chairman of the National Educational Committee will present another paper in the fine series which always meets the expectations of the convention attendants no matter how high they may be.

Although the program will be varied in order to give proper coverage to the subjects of greatest interest to a diversified membership, the treatment of the material will not be superficial. The speakers will dig into their subjects to bring out those matters most interesting to engineers who wish to know the basic facts and how best to apply them to daily operations.

A sufficient time will be apportioned after each paper to permit full discussion. The points on which attendants wish elaboration and the questions which occur to them will be fully covered so that full value will be derived by everyone from the subjects covered.

The educational program is always the primary attraction of the convention. There are other worthwhile features including the plant inspection trips, the recreation program and the good fellowship which all enjoy. They all will be combined to produce a really fine convention in Los Angeles on November 28 to December 1. Maintain your plans to be there. A vacation to southern California at that time will be ideal.

NAPRE Department

Memphis

BY CHARLES CONLEY

The members and friends of the chapter attended a show put on at the Peabody Hotel by Owens-Corning Fiberglas Corp. to demonstrate its building and engineering products and their application. Also in attendance were the local building supply and contractor groups and air conditioning engineers.

The show contained much of general interest to engineers. In addition there were demonstrations of the actual application of Fiberglas to air ducts, pipe lines and cold walls and floors. Much information to guide correct use of these materials was presented to the group.

The show was arranged by W. F. Hartnett, manager of the Fiberglas sales office in Memphis. A team of experts from the headquarters of the company led by Robert Gamble conducted the show and demonstration.

The effect and efficiency of the various forms of insulation were demonstrated in a number of interesting ways including keeping ice cream hard in a hot oven and retaining the heat of hot coffee in a refrigerator. Then the demonstration moved on to show the large number of Fiberglas products which are used in the manufacturing and construction industries.

The resiliency of Owens-Corning's newest insulating product, known as Aerocor, is demonstrated by opening a compression-packaged, foot square box from which the material expands seven feet high. The material is being used to insulate aircraft as well as automobiles, around air conditioning ducts and steam-traced pipe lines and domestic heating equipment. The "comeback" graphically visualizes savings that can be realized in warehousing space and shipping costs.

The program was preceded by refreshments and an excellent dinner was served to all the attendants. At the conclusion of the demonstrations, attendance prizes were awarded and an ice cube humidor insulated with Fiberglas was won by Thomas Clark of the Lilly Co., a member of the chapter.

Pyramid of Prizes Draws Interest

THE pyramid of unusual and desirable prizes to be awarded to the individuals doing the best job in the 1950 membership contest has evoked wide interest. Those who view the pile of prizes with a certain degree of expectation have inquired about the situation of some of their competitors elsewhere.

There is only one question Ray Burnett, guardian and eventual dispenser of the pyramid hoard, cannot answer. This one unknown involves the contents of the "mystery package" being furnished for the prize group by Seattle Chapter. When the pleased winner of this prize has opened it, he will have to tell Ray what it contained.

A question frequently asked is how an ordinary worker in the contest can compete with some of the big producers whose feats of the past have been published. Part of the answer is obvious. None of these men were saving or holding back for an easy run in the present contest. Apparently they have already worked their field intensively and on more than one occasion. Thus they have no advantage from a backlog of prospects ready to come in. They do have enthusiastic drive which is one of the most productive assets of a successful membership builder. Their methods, however, are no secret and can be adopted by others.

Reports show that the Pyramid contest remains wide open. Up to now no one has piled up a commanding lead on which he can coast to the end and win. Two and a half months remain before the finish line will be reached. In addition, it is emphasized that there are two divisions in the contest so that members of the smaller and the larger chapters will both have an equal opportunity.

Therefore every member has a good chance to be a big man around home by bringing in the stack of prizes.

We always do everything in our power to keep relations on a high plane. With this in view it might be well to answer the following inquiries directly by letter. They do indicate interest however and others may find the information valuable or interesting:

Question: How will that Puget Sound salmon compare with our Gulf fish? When we get it, how would you recommend that we cook it?—H.R.T., New Orleans.

ANSWER: We are too smart to be pulled in on any controversy between fishermen in different sections of the country. Our suggestion to you is to price canned salmon at the store or save up for several weeks and try to buy a whole salmon. At the risk of correction from Tacoma, we suggest that the best way to cook a whole salmon is to bake it.

Question: What was that boastful plug Stockton-Modesto ran in about their wonderful soil. Is it a fact that their vegetables are shipped in from the Los Angeles area to be frozen?—L.B.O., Sacramento.

ANSWER: We won't repeat it. No, it would not be correct to say that the vegetables are shipped in. After all, you know that Stockton and Modesto are in the Los Angeles area.

Question: Will I really receive a box of oranges in the Pyramid from Colton? I thought all the oranges are now being made into frozen concentrate.—T.A.G., Detroit.

ANSWER: You certainly are radiating confidence. Do you have a good stock of application blanks? The oranges Colton will supply are too good and costly to be made into concentrate. You will see what we mean if you pitch in and win.

Question: We use a lot of apples from West Virginia. I see that Yakima is putting apples in the Pyramid. Do they also grow good delicious apples around Yakima?—W.E.S., Pittsburgh.

ANSWER: What you do mean "also"? Those Yakima apples are so big they cut one apple up to serve a family of six. If you win that box of apples, your family will demand Yakima fruit from then on.

Would You Get Hurt This Way

TWO men were recently injured in removing a compressor head. Several weeks before the injuries occurred the ammonia compressors had been pumped down and the high side gauge showed no pressure. This gauge is on the discharge connection to several compressors so it apparently was assumed that there was no pressure in any of the compressors.

In order to remove the head from one of the compressors all of the head bolts but three on one side of the head were removed. At this point pressure beneath the head raised it with such force that the remaining bolts were bent. Ammonia was sprayed on the two workmen nearby and inflicted severe injuries to them including their eyes.

Discussion of such matters as opening up systems come up frequently in meetings but it is probably well to review the literature occasionally. A good discussion of the subject is presented in Good Practice Manual I, most recently published in the 1941 Operating Data Book.

Pumping Out and Opening

Before removing any heads, caps or other parts connected to the compressor, it is of course necessary to see

that no pressure exists in the cylinder. Many accidents have resulted through carelessness in this respect. All shut-off valves in piping leading to and from compressor should first be tested to make sure they are tight, if leaky valves are discovered they must be repaired. Ammonia fumes escaping after a cylinder is opened for inspection are sure to delay the work and make it highly difficult to effect completeness and accuracy. The inspection of all parts is highly important and therefore should be performed in a livable atmosphere and not under conditions that would cause one to overlook things that he otherwise would not.

Pumping Down

Most plants, of course, have a small compressor used as a pump-out machine. If all shut-off valves are tight on the machine to be opened for inspection it should then be pumped out. Pump down to a 5 or 10 in. vacuum, let stand for 15 minutes to see if vacuum holds. If it does not, pump down again. A small amount of gas, if the machine is a small one, can be admitted to the atmosphere from the indicator cock or other opening. When all gas is out, the valve caps and cylinder head can be removed. Care should be exercised in doing so, take off all nuts but two directly across from each other; then back these two off a full turn and loosen the cap with some pointed tool.

If gas escapes under pressure it will then be possible to tighten the cap immediately with the two remaining nuts. Never fail to do this regardless of how sure you are that no pressure exists. Failure to observe this simple and important rule has resulted in serious accidents. One must depend to a great extent on good judgment in pumping out a machine because after you have pumped for some time, your gauge may show a high vacuum, a correct reading, and still a considerable amount of liquid could be present in the cylinder and chamber of the compressor, because it requires a considerable length of time to boil off liquid. It must absorb heat to bring about the change from liquid to gas, gas only can be pumped out unless it is gravitated to the pump-out machine and this is seldom the case. It may be necessary to pump-out several times before a true pump-out is accomplished. Between pump-outs observe closely whether or not the gauge shows a rapid increase in pressure; if the gauge is correct and maintains a high vacuum for some time, it is safe to open the compressor.

New Safety Refrigeration Code Approved

THE revised safety code for mechanical refrigeration, commonly known in the refrigeration industry as the American Standard B9 Code, has been thoroughly revised, superseding the old 1939 edition of B9, and is now available for sale by the American Society of Refrigerating Engineers, 40 West 40th Street, New York City, for $1.00 per copy. The ASRE is sponsor of the Code which has been adopted as an industry standard by the American Standards Association.

The revised B9 Code is the result of several years' effort by an ASA Sectional Committee composed of 77 members and several subcommittees with more than 25 members. These members represent every phase of the refrigeration industry as well as casualty and insurance groups, the Bureau of Explosives, the valve and fittings industry, the National Fire Protection Association, the Underwriters' Laboratories, and many others.

New Code More Specific

The new Code is considerably more comprehensive than its predecessor. Additions have been made to clarify controversial sections in the old Code and to cover new equipment and installation procedures which have been adopted since the war. In general, all of the requirements are much more specific, more to the point, and more readily understood. Certain of the requirements dealing with piping, copper tubing, and fittings have been brought up to date and clarified.

The sponsors of the Code are emphatic in their recommendation that municipalities and states adopt the new Code in its entirety. The sponsors point out that, "a great deal of the value of the Code is lost if only sections of it are followed and practiced; the Code is built, one regulation upon another, and to use it piecemeal is to destroy the effectiveness of the document."

The foreword of the Code states, "It is desirable that this Code be universally adopted so that safety provisions for refrigerating installations will be standardized, thereby permitting quantity production of refrigeration equipment with minimum cost to the user."

An Interpretations Committee has been formed since the Code was issued last month to interpret and explain any provisions of the Code and to keep it abreast of the advancements in the art of refrigeration.

N A P R E Department

Air Conditioning Must Fit Installation

AIR conditioning in office buildings must be designed to fit that particular installation according to J. Donald Krocker, consulting engineer of Portland, Ore., who spoke at the recent annual convention of the National Association of Building Owners and Managers.

He emphasized the importance of careful selection of operating personnel as well as of equipment and system since it represents a continuing cost and the character of the operating personnel may have a definite influence on the cost. An operating engineer, he said, should be selected on the basis of alertness, mental adaptability to new ideas and permanence.

It is possible to provide indoor conditions that will be acceptable to about 95 percent of the average tenants, but not to 100 percent, he pointed out. To deal with the five percent who are not average, the operating engineer needs some of the qualities possessed by a diplomat. It is now the consensus of engineers that a year-round indoor temperature of 74 or 75 F, with air motion of 10 to 25 fpm velocity, and relative humidity ranging between 30 and 50 percent, is acceptable and proper for both winter and summer conditions, he stated.

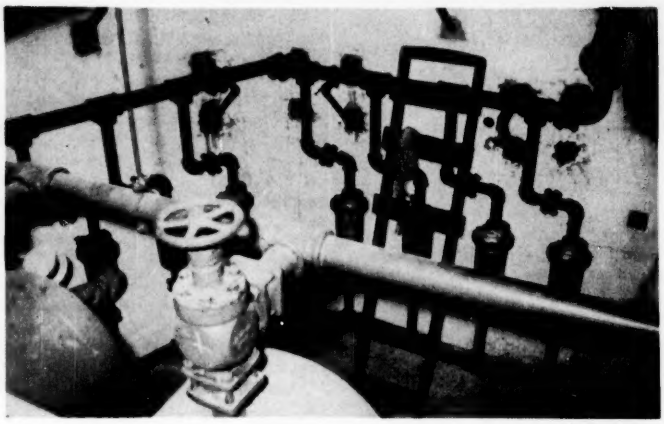
In determining whether air conditioning should be installed, such factors as arrangement of space, climate, and public demand need to be considered, he pointed out. Regardless of climate, air conditioning may be required in deep space, where natural circulation is lacking, and in stores and offices on lower floors, where heat is intensified owing to lights, people, or machinery.

Dry bulb temperature as read on an ordinary thermometer is not a criterion, since comfort is affected very considerably by humidity, he explained. A better criterion may be given in terms of dewpoint temperature or wet bulb temperature, as recorded by weather bureau stations. Generally, where the wet bulb temperature occurring annually exceeds 65 F, air conditioning of office space becomes desirable, and must be expected eventually.

For conditioning only a part of an office building, Mr. Krocker said, it may prove economically expedient to install a self-contained unit, with refrigerant compressors, coils, filters, and fans built into it.

Traps Insure Liquid Seal and Eliminate Power Wastage

A PROBLEM confronting many refrigeration plants is that of maintaining an adequate liquid seal in the refrigerant receiver. If the seal drops below the minimum 6 in. level, high pressure gas blows through the liquid line to the evaporator. The power used to compress this gas is thus wasted. In addition, this high pressure gas adversely effects evaporator operation. As a solution, the Armstrong Inverted Bucket Steam Trap installed between the receiver and expansion valve or valves proved perfectly practical.



Traps hooked up in parallel act as refrigerant liquid seals.

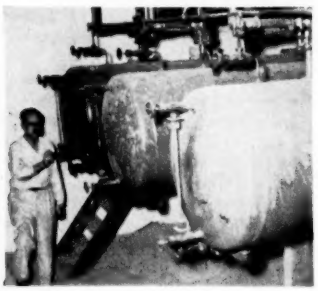
Trap Fills with Liquid

During normal operation with adequate liquid in the receiver, the trap as a liquid seal is completely filled with liquid. The bucket is down, holding the discharge valve wide open. When the liquid level in the receiver drops too low, gas enters the liquid line and eventually displaces liquid from the bucket, causing it to float and close the valve. Gas is stopped at this point until the proper liquid level is restored.

One of the latest to report complete satisfaction with this method is Nueva Fabrica de Hielo in Havana, Cuba. Due to its large refrigeration capacity (100 tons), this concern uses eight No. 216 Armstrong traps as liquid seals in the hookup as shown in the diagram. This means that the eight traps must pass 500 lbs. of liquid ammonia per minute. These seals have sufficient power to open at the full differential pressure between the high side and low side of the system.

Heads off Trouble

Ninety-nine per cent of the time the seals are wide open with the buckets resting on the bottom of the trap body. The liquid seal simply does nothing, except, in effect, stand by to head off trouble. The other one per cent, according to Neuva Fabrica de Hielo, the traps do just that and are an excellent means of cutting needless costs.



Front view of refrigerant receivers.

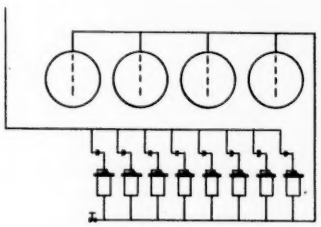


Diagram of liquid seal installation at Nueva Fabrico de Hielo, Havana, Cuba.

Absorption System to Air Condition Skyscraper

NEW YORK'S newest skyscraper, the Massachusetts Mutual Life Insurance Company Building, will be completely air conditioned by means of a rooftop installation of the new Carrier steam-operated absorption machine.

Four of the recently developed refrigeration machines, located atop the 27th floor of the building now rising at 600 Fifth Avenue, will employ district steam taken from the street mains to produce chilled water for the air conditioning system.

The Massachusetts Mutual installation will be self sufficient so far as any continuing water supply from outside sources is concerned. Make-up water for the cooling tower, replacing losses due to evaporation, will be recovered in more than sufficient quantity from the steam condensate. Each of the four absorption machines for the new building will have a capacity of 275 tons.

Carrier engineers reported that material savings in initial costs were made possible by the rooftop installation. In addition to space savings through elimination of the usual machine room in the basement, location of the refrigeration units on the same level as the cooling tower will make it unnecessary to install heavy piping for the pumping of condenser water from basement to roof.

The absorption units use only water as a refrigerant. Temperature is lowered through the flash evaporation of water sprayed into a high vacuum. Lithium bromide is employed as an absorbent, and can be used repeatedly without loss. When saturated, the water is boiled out of the solution by the use of steam, and the salt is pumped back into the absorber chamber. Thus a continuous cycle is established.

The machines themselves are light in weight, compact and all but vibrationless. And their operation provides a balance in steam loads for summer cooling and winter heating.

Mechanical Engineers Meet

MORE than 50 papers on power, fuels, hydraulics, railroads and kindred subjects were delivered in 22 technical sessions at the semi-annual meeting of the American Society of Mechanical Engineers which opened June 19 at the Hotel Statler, St. Louis, Mo. The session on Friday was given over to a tour of the synthetic liquid fuel plant of the United States Bureau of Mines at Louisiana, Mo.

Frozen Foods
*Reg. U. S. Pat. Off.
PREPARATION PACKAGING FREEZING STORAGE DISTRIBUTION DESIGN CONSTRUCTION EQUIPMENT

King Crabs Provide Quality Frozen Meat

TECHNIQUES used in the preparation and handling of king crab meat are discussed in a bulletin issued by the U. S. Department of the Interior. It points out that this meat must be processed with utmost care to insure the maximum retention of color, flavor and texture.

King crab meat is much more suitable for freezing than the meat of several other species of crab. Experimental packs stored at 0 F for one year have been found to compare favorably in regard to flavor and texture with samples stored only two months. On the other hand, frozen dungeness crab meat when packaged in cellophane was unpalatable after storage for three months.

Two important factors which lower the quality of the frozen king crab meat during storage at 0 F are changes in color and in texture. Crab meat which has been carelessly cleaned or washed is apt to show considerable bluish discoloration after processing. Crab meat which has been packaged loosely with considerable air spaces in the package is likely to turn yellowish. The use of an impure grade of salt in making brines for flavoring or for adding to the meat in the package will cause yellowing of the meat after long storage periods. Only high grade salt, such as that specified for mild-curing salmon, should be used in preparation of the crab meat.

Storage of frozen crab meat at higher temperatures of 10 to 15 F caused undesirable texture changes and excessive "drip" on thawing compared to packs stored at a relatively constant temperature of 0 F. For prolonged storage up to one year a temperature of 0 F or lower is most desirable.

King crab meat may be frozen in the shell, that is, the whole crab legs are frozen after butchering and cleaning. Although desirable for certain markets, king crab frozen in the shell is not as satisfactory for long storage as the packaged meat. Experimental samples of crab legs cooked before freezing have been stored at 0 F for periods up to six months without marked changes in flavor and texture. A slight toughening of the meat and increased difficulty in removing the meat can be expected in lots stored for long periods. Only crabs in which the legs are plump and well filled should be utlized. Older crabs, whose shells do not indicate a moult for some time, are usually thin and have meat of poor quality. Crabs which exhibit evidence of a recent moult are apt to show poor recovery of meat. These should not be frozen.

The freezing and storage of raw crab legs is not recommended. After a short storage period of only three months, the raw meat becomes discolored and off-flavored. In addition, the raw meat is difficult to remove from the leg segments as it adheres tightly to the shell. Cooking the raw crab legs after freezing and storage increases the difficulty of removal of meat. The texture of such crab meat is inferior and is apt to be soft and slightly "mushy."

After freezing, the cooked crab legs should be ice glazed for storage; otherwise moisture is lost rapidly through the shell and texture and flavor changes will soon render the meat inedible.

Legs which have been cooked, frozen, and glazed aboard ship may be thawed to allow removal of the meat for packaging or canning. This offers possibilities for refrigerated fishing vessels that do not have facilities for further processing aboard. One objection to holding large quantities of frozen king crab in the shell aboard the vessel is that the pay load will be relatively small, inasmuch as the legs are bulky per unit of weight. At least 100 cubic feet of space per ton of crab legs are required for storage.

The yield of butchered crab legs is approximately 50 percent meat by weight. Experimental packs of both packaged frozen crab meat and canned crab meat prepared from the frozen crab legs have been found to yield acceptable products. The meat from frozen legs utilized in this manner should be carefully inspected for discoloration or off flavors.

Frozen Fish Production in 14 Countries

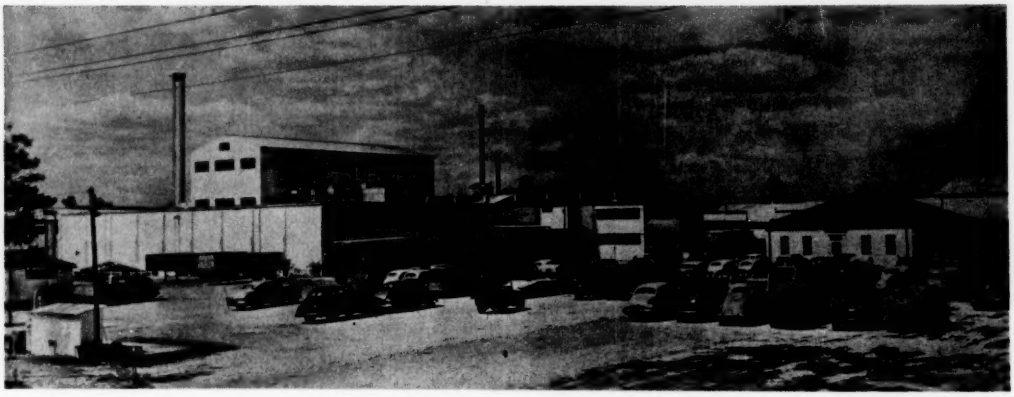
FROZEN fish production in fourteen countries for the past four years is compared in the following table prepared by the Food and Agriculture Organization of the United Nations.

PRODUCTION OF FROZEN FISH, 1946-1949
(WEIGHT IN METRIC TONS)

	1946	1947	1948	1949
Frozen fish[1]				
Belgium	....	....	....	274
Canada	54,586	30,701	49,875	54,195
Newfoundland	13,600	6,800	12,492	14,728
Denmark[2]	1,000	3,000	7,900	11,200
Finland	200	300	1,800	1,050
Iceland	25,333	19,235	31,927	37,895
Ireland	115	110	135	130
Italy	....	....	....	1,104
Japan	29,975	50,000	62,572	89,261
Netherlands	....	....	1,100	1,100
Norway	....	....	42,240	47,705
Philippines	200	261	595	146
United Kingdom[3]	....	....	18,038	24,093
United States of America[4]	127,035	128,128	132,443	144,400
Total	....	....	361,117	427,281

[1]In 1946 and 1947 frozen fish is included with fresh fish for Italy, Netherlands, Newfoundland, Norway, and United Kingdom.
[2]Faroe Islands and Greenland not included.
[3]England, Wales, and Scotland including Isle of Man, 1946-48. England, Wales, and Scotland, 1949.
[4]Including Alaska.

Juice Concentrate Plant Uses Reciprocating Refrigeration System



Exterior view of the orange juice concentrate plant shows cold storage warehouses and employee parking space in the foreground. The smokestack further back serves boilers located behind the high section which contains the concentrators. This Minute Maid plant in Plymouth is 15 miles northwest of Orlando.

NERVE center of one of the frozen-orange-juice-concentrate processes used at the expanded plant of Minute Maid Corporation in Plymouth, Fla. is a refrigeration system of the reciprocating type.

Makers of the largest selling frozen orange juice nationally use a process in which water must be removed from the juice at a low temperature. This is done by reducing the pressure within the concentrator, which in turn reduces the boiling point of the orange juice. The temperature of the orange juice in process never exceeds 75 F and when the pressure approaches 10MM, the temperature is about 60 F. At this temperature the concentrating equipment is capable of removing 34,750 pounds of water per hour from the juice.

Evaporators

To do this, the single strength orange juice is introduced into specially designed evaporators which liberate the water content. The warm condenser water from the refrigerant side of the system is used as the heating medium for the first effect of the evaporation. A Worthington horizontal multi-pass condenser 38 in. x 18 ft. is the source of this condenser water. (See picture on cover of this issue.)

Leaving the first effect evaporator the condensing water is returned to the refrigerant system where a control system is operated to mix some water from a cooling tower to effect a constant temperature available to the first effect evaporator at all times.

The vapor liberated in the first effect, after leaving a separator, becomes the heating medium for the second effect of the evaporation. The water vapor from the final effect after leaving its separator enters a vertical vapor condenser whereby the vapor, through the introduction of ammonia in a conventional manner, is condensed and the ammonia vapor is drawn off.

Vapor Condenser

A special designed Worthington ammonia vapor condenser 46 in. x 16 ft. is used for the all-important function of condensing the liberated vapors from the single strength orange juice. This vessel is designed for proper connection to the last effect vapor separator to insure vapor flow and the upward feed of ammonia through the tubes to obtain final result. For this process the Worthington Vapor Condenser is complete with a 42 in. x 8 ft. surge drum with float controls.

The ammonia vapor is returned to the reciprocating compressor, which is a 12 x 14 in. horizontal duplex ammonia compressor complete with 400 hp. synchronous motor. It is the control center of plant for this unit supplies the refrigerating effect necessary in transferring heat from condenser water to single strength juice, from water vapor to condensed liquid, from ammonia vapor compressed and then condensed to a liquid.

The ammonia-vapor is compressed and goes to a condenser, being converted into a liquid completing the refrigerant cycle. A 38 in. x 20 ft. ammonia receiver is the last item in the refrigerant system, collecting liquid ammonia from ammonia condenser. This vessel then directs liquid ammonia as a feed to the vapor condenser and surge drum assembly.

The orange concentrate drawn from the final effect of the evaporation is pumped to a blending and mixing system where the concentrate is blended with a predetermined portion of single strength juice.

Frozen Fish Inventory

STOCKS of frozen fishery products held on June 1, 1950 by firms reporting to the Fish and Wildlife Service totaled 96,301,637 pounds —4.8 million pounds more than were held on the same date in 1949, and 17.3 million pounds more than were in storage on May 1, 1950.

Data on the domestic freezings and holdings for June 1 are based on reports from 268 plants.

Students Explore Absolute Zero Phase

THE doors to the frigid world of absolute zero, 459 degrees below zero on the Fahrenheit scale, have been opened to undergraduate students for the first time in the world at the Massachusetts Institute of Technology this year.

Twelve senior students who received M.I.T. degrees have completed their required undergraduate research projects by making studies of the behavior of liquid helium—helium gas so cold (452 degrees below zero) that it turns into a colorless liquid, just as steam turns into water at 212 degrees above zero.

Never, before at any institution has sufficient liquid helium been available to make possible its use by such a large and relatively inexperienced research group. Financial assistance from the Signal Corps. Office of Naval Research, and Air Materiel Command, through contracts with M.I.T.'s Research Laboratory of Electronics, made the program possible for the 12 students majoring in physics.

Part of Low Temperature Research Program

Dr. Melvin A. Herlin, assistant professor of physics, believes that the students' work constitutes an important part of the low-temperature research program underway at M.I.T., with the cooperation of the Research Laboratory of Electronics and the departments of physics and mechanical engineering.

That the work was possible, he says, marks a real achievement in the mass production of low-temperature materials. Robert P. Cavileer of the M.I.T. research staff, whose responsibility it is to supply liquid helium to the many research activities which use it, has probably handled more of the elusive stuff than anyone else in the world. While the 12 seniors were working at top speed on their individual projects, during the past three months. he has supplied them alone with over 285 quarts of it.

Liquid helium is important because it liquefies at a lower temperature than any other gas—and thus is the lowest-temperature material available. Liquid helium is considerably colder than the liquid form of such common gases as nitrogen, oxygen, or air.

As such, it shows some phenomena which are among the top puzzles of physics today. At about two degrees below its boiling point, liquid helium begins to act like no other material known and enters what seems to be a "fourth state of matter."

It climbs up the sides of its containers; no dish can float in it. It conducts a pulse of heat in much the same way that ordinary liquids conduct a wave of sound.

Exhibiting these pecularities, liquid helium is called, for want of a better term, helium II. The heat waves flowing through it are called "second sound." Physicists think that an explanation of these phenomena—when achieved—may lead them to general information about the structure and behavior of all materials on this earth.

The 12 undergraduates, who have devoted about half-time to their reseach work during the past four months, have studied such matters as how to excite "second sound" in liquid helium, how to cool liquid helium below its boiling point, and how to condition laboratory equipment so that its parts will operate efficiently at these low temperatures.

Others of the group were concerned with the actual properties of liquid helium itself, the effect of its temperature and pressure on its unusual behavior phenomena such as "second sound."

Half the problem is learning how to manage liquid helium in order to study its properties. In air, it boils away so violently that it never reaches the floor when poured off a desk. The M.I.T. students who have spent four months with it have learned, by the hard road of experience, about how to use helium and how to measure its properties.

Innovations

They have made some innovations which Professor Herlin says are significant contributions to the techniques previously in use. They have laid important groundwork for future research—as well as for future careers for themselves in low-temperature physics. They have designed all of their equipment and built most of it, and much of that which they have built and used will continue in regular use in the M.I.T. low-temperature laboratories.

Low-temperature work on a scale such that undergraduate students may participate is possible at M.I.T. largely through the pioneering researches of Dr. Samuel C. Collins, professor of mechanical engineering. He has devoted many years of work to developing better ways of handling and studying low-temperature materials, and Dr. Collins is responsible for the original design of the machine which is now most widely used throughout the United States for producing liquid helium.

Low-temperature research, even in the extreme cold regions of liquid helium temperatures, requires other refrigerants as well. To supply these and other needs, M.I.T. maintains a low-temperature plant under Professor Collins' direction, where the weekly production of these refrigerating materials to meet the Institute's research needs is higher than in any other educational institution in the world. A typical week shows the manufacture of at least 200 quarts of liquid air and 800 quarts of liquid nitrogen, both from a plant designed by Professor Collins and operated under his direction.

While M.I.T.'s 12 undergraduates were at work on their low-temperature projects, they were using more than 200 quarts of liquid air each week for pre-cooling their apparatus.

Old Egyptian Custom Dries Up Speakers

RICH Riemenschneider found a way to cool off six panel speakers who talked too long.

The panel was answering questions at a convention in Milwaukee. Each member was taking five to 10 minutes to answer each question. The audience became restive.

Riemenschneider ordered a bowl of ice cubes and gave each speaker a cube to hold while speaking. The average speaking time dropped to one minute.

"It's a variation of an old Egyptian custom," said Riemenschneider. "The Egyptians made speakers stand on one leg."

New Dry Ice Plant Opens

MACHINERY and equipment has been installed by the Liquid Carbonic Corp., in its Houston, Tex., plant for the manufacture of dry ice. This plant was first built to make dry ice in 1935. It was making dry ice in 1937 when the plant was destroyed by fire. It was rebuilt primarily to manufacture carbon dioxide, but equipment to compress the liquid to dry ice was not installed.

Equipment added to make the dry ice includes a 36,000 lb. Lentz steam driven engine, compressors and auxiliary equipment, drive shafts, blower, condensers and evaporator.

India Prefers U.S. Refrigeration Products

IN THE opinion of Ahmed A. Fazelbhoy, retiring president of the Refrigeration and Air Conditioning Trades Association Ltd., Bombay, India, "United States refrigeration equipment and supplies are less expensive and better quality than equipment and supplies from Sterling area countries." Mr. Fazelbhoy was presenting his annual report at the first annual meeting of the newly formed association and was encouraging his government to issue limited import licenses for the purchase of refrigeration equipment from the United States and other dollar currency areas.

Contribution of Refrigeration

Mr. Fazelbhoy pointed out graphically the tremendous contribution that refrigeration equipment can make to the welfare and industrial advancement of India, particularly with its tropical climate. He paid tribute in glowing terms to American manufacturers, in stating that "the United States is a country of immense manufacturing and financing resources, and being itself a partly tropical and subtropical area, and having a large domestic and export volume, the cost of production per unit is greatly lowered, as compared to any other country due to mass production, advance techniques and availability of the best kind of raw materials. The manufacturers also have far more experience than those of any other country in the manufacture of products such as refrigerators, water coolers, bottle coolers, commercial refrigeration equipment, air conditioning equipment, etc., and essential supplies, such as "Freon", copper tubing, coils, valves and fittings. The United States has more inventions and improvements on refrigeration equipment to its credit than any other country."

As examples of handicaps with which the industry is confronted, under present restrictions, he cited specific cases wherein manufacturers are forced to purchase copper tubing of an inferior manufacture as compared to the product available from the United States. He also related the purchase of a large number of hermetic units from a European country, all of which had to be immediately replaced because of inferior design and workmanship.

He advised his government that it was false economy to be forced to use these inferior products, and that some limited import adjustment should be made for the purchase of U. S. products. He pointed out that it is imperative to India's progress to have such equipment available.

Other products that are in demand are "Freon", methyl chloride and sulphur dioxide. With a total ban on these products from the United States, India has been forced to use materials available in other than dollar area countries of greatly inferior quality, which adds considerable to the cost of maintenance and servicing. In the case of Freon, the association made application to their government for the import of a sufficient quantity of gas, but it was allowed one-fifth of the quantity applied for. Considering the unsatisfactory service from available equipment and components, it was his opinion that restrictions by the Indian government were economically unsound.

He also expressed the belief that the association should concern itself with the improvement of sanitary methods of manufacture and distribution of perishables, ice cream and other refrigerated products. He pointed out, too, the difficulty in convincing his government of the various classifications of refrigeration equipment, as much commercial equipment now imported into India is classified as domestic refrigerators requiring a much higher import tax.

To answer the demand for men qualified in refrigeration engineering in India, he announced that in memory of his son who had died in New York while studying refrigeration engineering, he and his wife had contributed funds to found the Munir Fazelbhoy College of Refrigeration and Air Conditioning Engineering, which will be affiliated with the M. H. Saboo Siddik Institute of Bombay, where instruction will be given in training refrigeration mechanics, master mechanics and engineers.

Mr. Fazelbhoy acts as India distributor of equipment made by the Howe Ice Machine Co., Chicago, Ill.

Engineers Visit Plant

A FEATURE of the convention of the American Society of Refrigerating Engineers held at Kansas City in June was a trip through the plant of the Owens-Corning Fiberglas Corp. The fiberglas concern presented to the convention, methods of development and manufacturing. Principal speaker was Vincent Di Maio, manager of the refrigeration appliance sales section of Toledo, Ohio.

Inspection Service for Frozen and Iced Shrimp

ON APRIL 21, 1950, the Food and Drug Administration issued a draft of proposed regulations for the expansion of the seafood inspection service to cover frozen and iced shrimp products. At that time the industry was invited to submit comments and suggestions in writing by May 15, 1950.

In response to requests that informal conferences with interested persons be held, the dates for receiving comments was extended to June 15, and conferences were scheduled. Comments at these conferences and responses to the proposed expansion of the Inspection Service indicate a lack of interest for the expanded service on the part of those who have expressed their views. Therefore, no further efforts will be made to promulgate the regulations in final form unless there are submitted written requests for the expanded service from a substantial portion of the industry. Should a substantial number of requests be received, it will be necessary to study more thoroughly the suggested changes in the regulations before drafting the regulations in final form. In this event, the final regulations cannot be made effective before January 1, 1951.

Current regulations for the inspection of canned shrimp will remain effective for the year beginning July 1, 1950. Applications for canned shrimp inspection service will not commit the canner to accept the inspection service on frozen and iced shrimp during the applicant's inspection period, if the service is later extended to these products.

Acceptance of the inspection service on canned shrimp has never been compulsory. If inspection service is eventually established for frozen and iced shrimp, it likewise will not be compulsory.

Cast-Brass Solder-Joint Fittings Standard

A NEW American standard for cast-brass solder-joint fittings has been recently released following its adoption by the American Standards Association on April 12, 1950. Known as ASA B16.18-1950, it was sponsored by the American Society of Mechanical Engineers; the Heating, Piping and Air Conditioning Contractors National Association; and the Manufacturers Standardization Society of the Valve and Fittings Industry.

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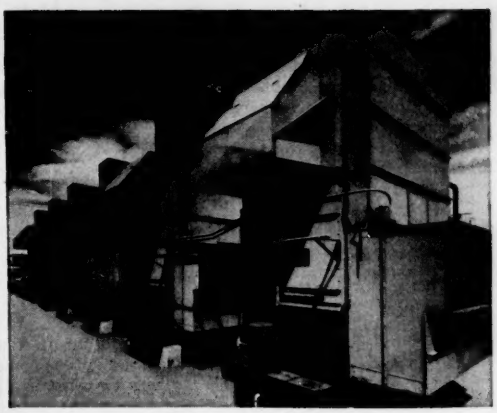

Cut Costs TWO WAYS

By Modernizing Your Refrigeration With This New Condenser System

● Power savings and water savings combine to make money for you when you replace an old fashioned refrigerant condensing method with a modern Niagara AEROPASS Condenser. Either saving quickly returns the cost of the installation; both together make an important reduction in your operating costs for refrigeration.

In this new method the refrigerant gas passes through two cooling coils. The first coil, air-cooled, removes the superheat and condenses oil vapor from the refrigerant; the second condenses the refrigerant by the evaporation of a water spray from its surface. The heat is transferred to the air; less than 10% of the water used in conventional condensers is consumed and you save the cost of the water and the cost of its piping, pumping and disposal.

In addition the Niagara Aeropass Condenser controls the head pressure of your compressors at the lowest point for good operation, reducing your power bills. It does this automatically the year 'round, giving full capacity for peak summer loads and providing the greatest power saving in cold weather.

Hundreds of experiences in all industries that use refrigeration demonstrate these benefits and prove that they give a lasting improvement in refrigeration plant operation.

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Carrene-7 Higher Refrigeration Capacity

REPORTING for the first time on the performance and application of the newly-invented refrigerant, Carrene-7, C. M. Ashley, chief development engineer for Carrier Corporation, told the American Society of Refrigerating Engineers that field and laboratory tests proved it would meet refrigeration capacity and horsepower requirements of 17 to 18 percent more than Freon-12 for a given compressor displacement.

In a paper delivered before the Spring meeting of ASRE at Kansas City, Mo. Mr. Ashley said that Carrene-7, as a companion to Freon-12, was applicable to a wide range of refrigeration systems "where additional capacity is desired." The new refrigerant, he said, should be "especially useful" in the following situations:

Filling job requirements falling between existing compressor capacities; matching additional motor sizes within and beyond the Freon-12 compressor line for air conditioning loads; utilizing full motor capacities for commercial refrigeration; increasing the capacity of existing installations, and raising the capacity of 25 and 50 cycle systems to equal the 60 cycle system using Freon-12.

Carrene-7 has not yet been made available commercially. It was invented by Dr. W. A. Pennington, chief chemist and metallurgist at Carrier, and W. H. Reed, former Carrier fellow at Syracuse University, and was announced last March before the American Institute of Chemical Engineers.

Higher Pressure than F-12

Mr. Ashley reported that the new refrigerant operates at approximately 18 percent higher pressure than Freon-12 at the same temperature and that the refrigeration systems must be suitable to withstand this pressure. He added that Carrene-7 had met design objectives as to high chemical stability, had proved nonflammable at reasonable temperatures and had passed satisfactorily through tests for toxicity and corrosive qualities. Describing direct comparative tests between the performance of a 5 hp compressor using Carrene-7 and Freon-12 under identical conditions, he stated that Carrene-7 showed a capacity of 17.5 percent more than Freon-12 and a power input of 17.3 percent more when running at 1750 rpm.

A further laboratory check on relative performance was made in a 3-ton self-contained unit, he continued, with the Freon-12 compressor operating at 60 cycle speed and the Carrene-7 at 50 cycle. Tests were run with 67 and 78 F. entering wet bulb air temperature and with 75 F entering and 95 F. leaving water temperature. The Carrene-7 tests at the 50 cycle speed showed slightly better performance than the Freon-12 at 60 cycle, he said.

Field Tests

In the course of an extensive program of field testing, the speaker declared 1,000 pounds of Carrene-7 was prepared in the Carrier laboratory and charged into 32 existing systems under the direct observation of the engineering staff. The systems varied from ¼ to 40 hp and represented both self-contained and built-up types. They included both air and water condensing units and were for both refrigeration and air conditioning duty. Some of the equipment had been operated up to 4,000 hours over a two-year period and several units were on 24-hour life test.

"This program," he said, "permitted our engineering staff to develop satisfactory application techniques and to broaden our experience as to the practical value of the refrigerant. The results of the program have been highly satisfactory and there has been no difficulty attributable to the refrigerant with any of the installations. In addition, several installations of transportation air conditioning were made which had extremely adverse conditions as to evaporator and condenser temperature and which have also performed in a satisfactory manner."

As a second step, a broader field program was then initiated in which a limited quantity of Carrene-7 was made available to a selected list of dealers. The results so far, he reported, have been gratifying.

Dealing with items of a practical nature in the application of Carrene-7, he said that if the full increase of approximately 18 percent in capacity was to be realized it was necessary to provide approximately 18 percent increases in capacity for all of the other elements in the system other than the compressor. He added, however, that in some existing systems it might prove advantageous to change the refrigerant only without changing the physical system.

For evaporator temperatures in the range used for comfort air conditioning, he stated, Carrene-7 can be used with expansion valves designed for Freon-12 by a re-adjustment of the setting.

The moisture solubility of Carrene-7 is several times greater than Freon-12 and there is less danger of difficulty due to the precipitation of the moisture in the form of ice, he added, but it is still advisable to maintain the same standards of dehydration of the system as with Freon-12.

Sales and Reorganizations

Selma, Ala.—The Crystal Ice Co., has been purchased by J. L. Reed of Lonoke, Ark. The plant was purchased from C. W. Bolton who built it two years ago.

Clarendon, Ark.—The Standard Ice Co. of Arkansas, Inc., has purchased the ice plants here and at Holly Grove.

Pueblo, Colo.—Sylvanus S. Hynes, owner and operator of the Hynes Ice Co., has sold the business to Mr. and Mrs. George Koch of Salida who have taken immediate possession. Mr. Koch also owns and operates the Koch Ice Co. in Salida.

Tampa, Fla.—The Florida Frozen Products Co. Inc., has purchased the personal property of the Florida Frozen Food Products. The property includes the main plant at 1814 Franklin St. and the branch plant at Barcelona St. Interest also is held in a former piece of property on Osborne Ave. The company is capitalized at $150,000.

Sparta, Ga.—The Spartan ice plant has been purchased by C. E. Brown of Athens, Ala. The bottling plant, which has been operated in connection with the ice plant, will be continued as Mr. Brown is owner of the Red Rock Bottling Co. in his home city.

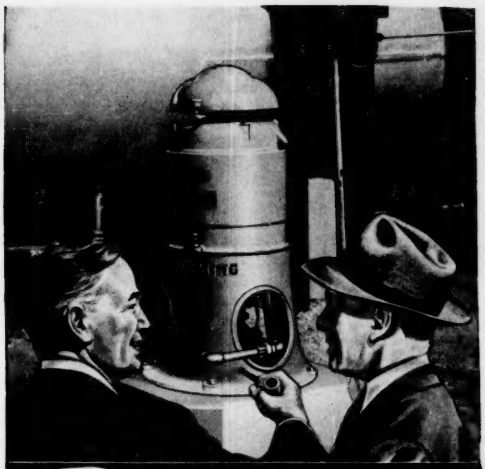
New York, N. Y.—Armand and Earl Canto have acquired the National Cold Storage Co., and its subsidiary, Beinecke, Inc.

New York, N. Y.—Merchants Refrigerating Co. announces that Cortley Frosted Foods, Inc., has leased office and operating space at its Seventeenth St. and Eleventh Ave., warehouse.

New York, N. Y.—The one-story ice plant at 319-23 E. 45th St., owned by Rubel Corp. and assessed at $115,000, has been sold in an all-cash transaction to an investor by H. Clayton Smith & Co., city brokers. The former owner will continue to use and occupy the property under new lease.

Shelter Island, N. Y.—The Shelter Island Farmer's Cooperative, Inc. has purchased the Moser plant here for a reported consideration of $8,500 and is planning to operate a complete plant for the packaging and quick-freezing of lima beans this year. They expect to handle 307 acres of limas and anticipate a total production of 700,000 pounds of frozen limas.

New Lexington, Ohio—The Seaman Ice Company has been purchased by Aloysius Beshara, Glouster, who will move here.



A *Deming* DEEP WELL TURBINE PUMP CUTS COSTS OF WATER TO "ROCK BOTTOM"

● A dairy company in Arkansas reported a saving of "at least $2000.00 annually" in costs of water after installing a Deming Deep Well Turbine Pump. The comparison was made with costs of "city water."

Another company, using a larger volume of water, reported "We estimate a net saving of $5000.00 a year with our Deming Turbine Pump."

Those are only two of a multitude of cases where Deming Deep Well Turbine Pumps are cutting water costs to "rock bottom."

Deming Turbine Pumps are built for wells 4" to 16" or larger and are available in capacities from 15 to 3000 gallons per minute. Various types of drive are obtainable to meet practically any power requirement.

A Deming Distributor is near you for prompt cooperation and service.

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BULLETIN No. 4700. Send for this 20-page illustrated bulletin which gives complete details about Deming Deep Well Turbine Pumps.

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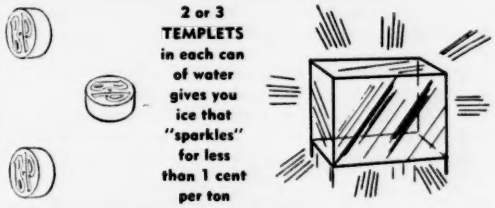
Summer production demands *FASTER FREEZING* in your plant...

TEMPLETS permit you to safely lower the temperature of the brine and produce more ice per can when you need this extra capacity. TEMPLETS reduce the tendency that ice has to crack at these lower freezing temperatures . . . improve temper . . . reduce shattering and bad breaks.

TEMPLETS aid in eliminating the cloudy veil, white butts and heavy cores which impair clarity of sized ice, cubes or blocks. Customers are pleased with ice that is crystal clear. TEMPLETS give your ice that *eye appeal.*

The B-P Templet treatment costs approximately . . .
1¢ PER TON



2 or 3 TEMPLETS in each can of water gives you ice that "sparkles" for less than 1 cent per ton

If you have experienced objectionable conditions in your plant, you need the B-P Templet treatment.

Surprising results are reported by many ice plant operators. Use B-P Templets in your plant this season and get full tonnage of clear ice from fast freezing. Get the complete story. No obligation. The coupon is for your convenience.

TEMPLETS are being used in Ice Plants throughout the United States and in many Foreign Countries.

BARADA & PAGE, Inc.

Guinotte and Michigan Ave's., Kansas City 1, Missouri

Kansas City, Mo.; Tulsa, Okla.; Oklahoma City, Okla.; Wichita, Kans.; Dallas, Texas; Houston, Texas; New Orleans, La.; St. Louis, Mo.

Mail this Coupon for Trial Sample

Barada & Page, Inc.
Guinotte and Michigan Ave's.
Kansas City 1, Mo.

Without obligation send me a sample and literature on B-P TEMPLETS.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....
I&R 8-50

Wadsworth, Ohio—The Henry Coal & Ice Co., dealers in the city for more than a quarter of a century, has sold its Wadsworth holdings to the City Coal & Supply Co.

Harrisburg, Pa.—United Ice and Coal Co. recently conveyed to the Commonwealth of Pennsylvania its ice and storage plant at Seventh and Forster Sts. for $475,000, according to a deed filed for record at the Dauphin County Courthouse. It is presumed that the Division of Unemployment Compensation, Department of Labor and Industry, will erect an office building on the site at some future date. The sale of the plant will not affect other operations of the ice and coal company, it was announced.

Mt. Carmel, Pa.—Joseph R. Aimetti has purchased the Mount Carmel Brewery, and after extensive improvements and alterations, new technical skill will be employed to insure and protect a perfect product.

Steelton, Pa.—Mrs. Mary S. Meckley, Elizabethtown, has purchased the one-story cinder block ice plant on the western side of Frederick St., this city. Revenue stamps indicate a $22,000 consideration.

New Kensington, Pa.—The Parnassas Ice & Storage Company was advertised for sale recently. Land, buildings, and equipment were disposed of. The owners hoped to sell the plant as a going business, to keep the industry in Kensington. The business was founded in 1922 by C. H. Dyer, R. L. Dyer, and Robert C. McKay for $50,000. Its present value was reported to be $194,000. The present operators took over in 1932, with R. L. Dyer as president and his brother A. B. Dyer as vice-president.

San Angelo, Tex.—West Texas Utilities Co. has sold to the City of San Angelo its municipal water system in that city, and has disposed of its ice properties in several towns to the West Texas Ice Co. Ice plants and properties sold to West Texas Ice Co. are at Presidio, Eldorado, Marfa, Alpine, San Angelo, Vernon, Quanah, Chillicothe, Childress, Estelline, Hedley and Memphis, Tex., together with a number of other ice sale stations and equipment. J. L. Shaw is president of the West Texas Ice Co. and expects to move here from his home in Carlsbad, N. Mex., to direct operations of the new properties. Mr. Shaw, who has had more than 17 years' experience in operating ice companies, is also president of the Bond Ice Co., of Carlsbad.

Gravenstein Apple

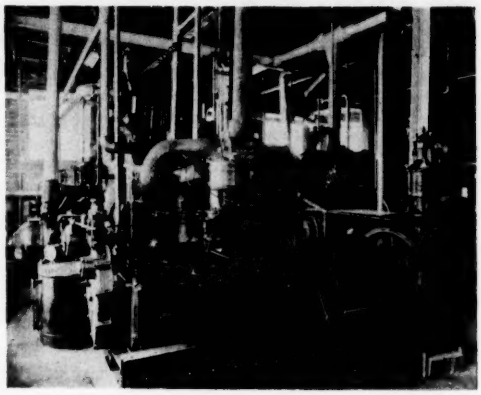
(Continued from page 42)

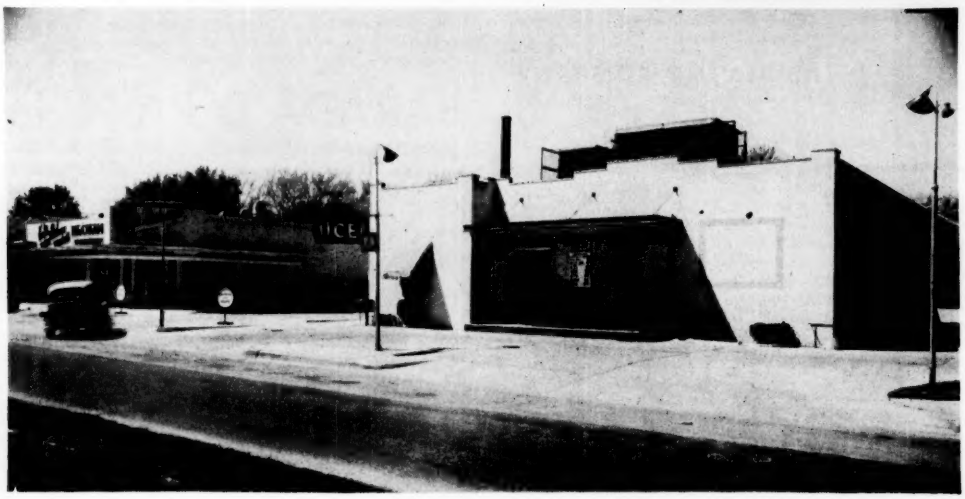
show enough bitter pit to make them unattractive on arrival.

Where the fruit is stored loose, sorted and packed just prior to shipment, then its temperature is raised and in some lots noticeable ripening and bitter pit may occur in transit.

Gravensteins to be used for applesauce may be held in storage nearer to the end of their life than when sold as fresh fruit. Quality of the finished product is the limiting factor, rather than appearance of the fruit. Incipient scald and bitter pit will not make any appreciable difference in the quality of the sauce. Loss of fresh fruit flavor will adversely affect the quality of the canned product and browning and breakdown render the fruit valueless. Fruit showing these disorders should be removed from storage before the condition becomes serious.

The Williams Bros. Ice Cream Plant at Oklahoma City, Okla. At the right, this Caterpillar Diesel Sixty tractor engine converted to natural gas is used to drive a 47 hp electric load. This engine, which is used about 100 days each year is 18 to 24 years old. Since its purchase secondhand in 1937, the crackshaft was ground, new bearings added, and other parts were purchased at a cost of $250. Owner Williams was impressed by the availability of parts for this antique.



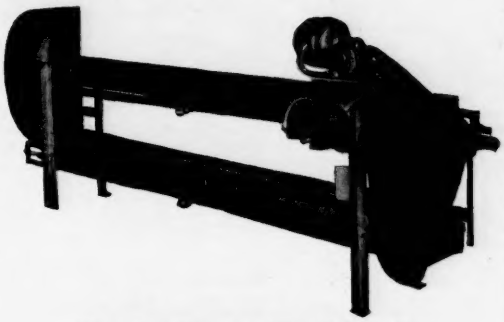


Install A Polar Vendor *NOW* for
EXTRA ICE SALES...EXTRA PROFITS

You too can increase your sales and profits—AUTOMATICALLY — by installing a Polar vendor in your storage room or vault.

The Polar vendor operates 24 hours a day, every day of the year, making cash ice sales for you. Your customers will like this quick and convenient method of purchasing ice at your dock whenever they want it.

The dependable Polar vendor is equipped with delivery chute, outer vendor door and frame, multiple coin unit, automatic counter and a trap door. Constructed of the finest materials available on the market, the Polar vendor will give years of trouble-free service. Choose from seven standard sizes with one, two, three or four belts.



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Merchandise Ice The Polar Way
VEND CAKES OR BAGS OF ICE AUTOMATICALLY
24 HOURS A DAY—EVERY DAY OF THE YEAR

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SALES OFFICE AND FACTORY
MONTGOMERY, MINNESOTA BOX 337 TELEPHONE 213

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ARMOUR'S ANHYDROUS AMMONIA

Armour's Anhydrous Ammonia is pure and dry . . . free of moisture and non-condensable gases. And to insure trouble-free operations, every cylinder is tested and checked before shipping to give positive assurance of fine quality.

Remember, too, that fast shipment is an Armour byword. In fact, many customers receive their Armour's Anhydrous Ammonia the day it is ordered. 65 conveniently-located stock points are your assurance of receiving prompt shipment of Armour's Anhydrous Ammonia in either 50, 100 or 150 pound cylinders where you want it, when you want it and fast.

Please return empty cylinders!

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Armour and Company
1355 West 31st Street • Chicago 9, Illinois
North Bergen, New Jersey

Fires and Accidents

Fresno, Calif.—The Ice Sickle frozen food plant here was destroyed by fire, the estimated damage of which was placed at $650,000. Floyd Berkenkamp, one of the owners, said the building and equipment were valued at $250,000, while fruit stored in the plant was worth $400,000. The blaze is believed to have started with an explosion.

Winter Haven, Fla.—Fire destroyed buildings of the Snively Groves, Inc., and the Polk Packing Association recently. John A. Snively, head of the two firms, estimated his loss at nearly $3,000,000, including destruction of all except one of the buildings and loss of the entire inventory of 350,000 to 400,000 cases of orange and grapefruit juices. All records of the corporation for the last 30 years were destroyed.

Asheville, N. C.—The Asheville Ice and Storage Co. suffered a fire loss estimated at $30,000. An empty ice storage room and an asphalt and wood roof covering two-thirds of the plant were destroyed. No storage losses were suffered, and ice manufacturing continued.

Muskogee, Okla.—Clifford Daniels, night engineer at the Home Ice Co. plant 560 North Third, suffered minor head cuts and vapor burns in the eyes when a by-pass valve on an ammonia compresor blew out.

Kansas City, Mo.—An ice cream plant on the Twin Sycamore farm of Fred Wolferman, Inc. at 97th St. and Holmes Road, Jackson County, was destroyed by a fire estimated to have caused a $200,000 damage. The blaze began in the ice cream plant after an explosion had rocked the structure.

New Incorporations

Lufkin, Tex.—Incorporation of the Pure Ice Co. has been announced by Vance M. Thompson Jr., H. Ripley Thompson and Mrs. Barbara Thompson. The firm was chartered with $50,000 capital stock.

Trinity, Tex.—The Chamberlain Ice Co. has been incorporated with $1,000 capital stock by G. H. Chamberlain, Allen G. Chamberlain and Mrs. Morene Chamberlain.

Uvalde, Tex.—The Uvalde Ice and Cold Storage Co. has been incorporated with $20,000 capital stock by J. A. Smylie, O. B. Smylie and J. W. Smylie.

Brattleboro, Vt.—Shaw Dairy-Maid Ice Cream, Inc. filed incorporation papers recently. Capitalization of 100 shares of $100 par value common stock is authorized. Woodrow F. Shaw, E. Stanley Weston and George L. Tupper, all of this city, are the incorporators.

Marshfield, Wis. — Marshfield Cold Storage Co. has been incorporated with 2500 shares of common stock without par value to manufacture ice and refrigerants for sale and to provide cold storage for freezing of perishable merchandise, etc. Incorporators are Ruth Ryan, Mary Clarke and Adeline Kowalski.

Convention Calendar

NATIONAL ASSOCIATION OF ICE INDUSTRIES
October 31—November 3, 1950
Sherman Hotel, Chicago, Ill.
Mount Taylor, Executive Secretary

CANADIAN ASSOCIATION OF ICE INDUSTRIES
November 7-9, 1950
Chateau Frontenac Hotel,
Quebec City, Canada
Mrs. Mildred Croft, Secretary

DELTA STATES ICE ASSOCIATION
November 13-15, 1950
Hotel Marion, Little Rock, Ark.
R. N. Milling, Secretary

NATIONAL ASS'N. PRACTICAL REFRIGERATING ENGINEERS
November 28-December 1, 1950
Hollywood-Roosevelt Hotel,
Los Angeles, California
Emerson Brandt, Secretary

CALIFORNIA ASSOCIATION OF ICE INDUSTRIES
December 4-5, 1950
San Francisco, Calif.
Jack L. Dawson, Exec. Mgr.

SOUTH CAROLINA ICE MANUFACTURERS ASSOCIATION
December 11-12, 1950
Columbia, S. C.
George L. English, Secretary

Association Directory

AMERICAN INSTITUTE OF REFRIGERATION
H. T. McDermott, Gen. Secretary, 433 N. Waller, Chicago 44, Ill.

NATIONAL ASSOCIATION OF ICE INDUSTRIES
Mount Taylor, Secy., 1706 L St., N. W., Washington 6, D. C.

NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES
Wm. Dalton, Exec. Vice-Pres. Tower Bldg., Washington 5, D. C.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATING ENGINEERS
Emerson A. Brandt, Secretary 435 N. Waller Ave., Chicago 44, Ill.

California Association of Ice Industries
Jack L. Dawson, Secretary
461 Market St., San Francisco, Calif.

Canadian Association of Ice Industries
Mrs. Mildred E. Croft, Secretary
317 Eglinton Ave., Toronto, Canada

Delta States Ice Association
R. N. Milling, Secretary
Ouachita Bank Bldg., Monroe, La.

Eastern States Ice Association
Samuel Freer, Secy.-Treas.
12 So. 12th St., Philadelphia, Pa.

Florida Ice Association
Muriel Washburn, Secretary
1926 Silver St., Jacksonville, Fla.

Illinois Association of Ice Industries
W. D. Wright, Secretary
Clinton Pure Ice Co., Clinton, Ill.

Indiana Association of Ice Industries
Robert W. Walton, Secretary
Board of Trade Bldg., Indianapolis, Ind.

Kansas Association of Ice Industries
C. A. Berkhiser, Secretary
Manhattan Ice & Cold Storage Co.,
Manhattan, Kans.

Kentucky Ice Manufacturers Association
R. T. King, Secretary
429 S. Seventh St., Louisville, Ky.

Michigan Ice Industries Association
Edward W. Jackson, Secretary
131 E. Kalamazoo Ave., Kalamazoo, Mich.

Missouri Ice Manufacturers Association
V. A. Esphorst, Secretary
3820 Washington St., St. Louis, Mo.

Mountain States Ass'n of Ice Industries
J. R. Espy, Secretary
Espy Ice Co., 2229 - 15th St., Denver, Colo.

Nebraska Association of Ice Industries
Frank Vogelsang, Secretary
W. T. Good Ice Co., Lincoln, Nebr.

New England Ice Association
Raymond Wilber, Secretary
419 Boyleston St., Boston, Mass.

New York State Ass'n Ref. Warehouses
Chas. G. Ashe, Secretary
101 Columbia St., Buffalo 5, N. Y.

North Carolina Ice Association
Lewis H. Powell, Secretary
Capital Ice & Coal Co., Raleigh, N. C.

Northwest Association of Ice Industries
Ed. H. Shea, Secretary
2027 N. E. Schuyler, Portland, Oreg.

Ohio Association of Ice Industries
Guy W. Jacobs, Secretary
The Steubenville Ice Co., Steubenville, O.

Oklahoma Association of Ice Industries
Harry T. Hudson, Executive Secretary
708-9 Perrine Building, Oklahoma City, Okla.

Pacific States Cold Storage Warehousemen's Association
Jack L. Dawson, Secretary
461 Market St., San Francisco, Calif.

South Carolina Ice Manufacturers Ass'n
Geo. L. English, Secretary
P. O. Box 603, Columbia, S. C.

Southern Ice Exchange
Richard W. Florrid, Secretary
11½ Forsyth St. N. W., Atlanta, Ga.

Southwestern Ice Manufacturers Ass'n
P. A. Weatherred, Secy. Counsel,
Mercantile Bank Bldg., Dallas, Tex.

Tennessee Ice Manufacturers Association
W. E. Harlan, Secretary
Mt. Pleasant Ice Co., Mt. Pleasant, Tenn.

Tri-State Association of Ice Industries
L. R. Girton, Secretary
260 Boyce-Greeley Bldg., Sioux Falls, S.D.

Virginia Ice Manufacturers Association
H. H. Snyder, Secretary
Alexandria, Va.

West Virginia Association of Ice Industries
E. Dana Smith, Secretary
Diamond Ice & Coal Co., Charleston,
W. Va.

Wisconsin Association of Ice Industries
Paul F. Hoff, Secretary
1300 East Locust St., Milwaukee, Wis.

The Refrigeration BRINE MEDIUM that gives you 5 ADVANTAGES

SOLVAY

CALCIUM CHLORIDE

1. Provides a "long-life" brine . . . lowest cost in long run.
2. Allows safe operation at low temperatures... permits quicker freezing.
3. Makes your equipment last longer.
4. Easier operation . . . requires less pumping.
5. Reduces possibility of costly shut-downs and repairs.

Available for immediate shipment from more than 200 local stock points.

Free literature on brine maintenance available on request.

SOLVAY SALES DIVISION
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40 RECTOR STREET, NEW YORK 6, N. Y.

"HERE COMES BARRETT!"

Here comes Barrett Standard Anhydrous Ammonia . . . ON TIME! Fast delivery is a special feature of Barrett service. Convenient coast-to-coast stock points make it easy.

When you place your order with Barrett, you know you can depend on speedy arrival of ammonia of unexcelled purity and consistent high quality. Cylinder valves are in perfect working condition . . . and empty cylinders are picked up promptly.

When you need expert advice, Barrett's trained technicians stand ready to help you without charge or obligation. Barrett is the name to remember, when you need ammonia.

Barrett* **STANDARD ANHYDROUS AMMONIA**

In 150, 100 and 50-pound cylinders for fast delivery from a stock point located near you.

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NEW PLANTS and IMPROVEMENTS

This Department each month presents the more important developments covering new construction, as well as additions, improvements, remodeling, and installations of new equipment in ice and cold storage plants and other industrial plants that use refrigeration. News notes on all such new construction and improvements are invited.

Arkansas

Benton, Ark.—One of the most efficient and up-to-date units of the State Hospital for Nervous Diseases near here is the cold storage and cannery building which was put into operation recently as a part of the $4,000,000 construction program now underway at the hospital. The cold storage plant and cannery processes and handles most of the food provided daily for about 3,000 of the population of State Hospital, and constitutes a fair sized industry within the hospital organization. Hershel Nelson is the cold storage plant supervisor.

California

Merced, Calif.—A large-scale turkey processing plant is to be built here in the near future, to be operated by the Merced Feed Co. The project will represent an investment of $225,000.

Sacramento, Calif.—The Crystal Ice & Cold Storage Co., 1812 Seventeenth St., began rounding out a three-year expansion program this week with the construction of a cold storage building adjacent to existing buildings. The building is a 36 x 72 ft. cold storage warehouse, 20 ft. in height, of concrete construction, to cost approximately $18,000 when completed.

Canada

Calgary, Alta.—Alberta Ice Co. Ltd. has a new $150,000 ice plant under construction. Charles G. McNaughton is managing director.

Colorado

Alamosa, Colo.—The newly completed Valley Ice Co. started daily production of 256 tons of ice. The plant has been erected on the La Jara highway, near the outskirts of this city, and fills a need created when the Railway Ice plant burned last winter. After the growing season gets well underway, the plant will furnish from 600 to 700 tons of ice daily for produce shipment. Roy D. Golston is principal owner.

Denver, Colo.—Installation of the newest and most modern railroad icing facilities in the west—including two mechanized car icers of unique design and a 16,000 ton ice storage house—has been completed at the Denver, Rio Grande & Western new north yard here. The new facilities will cut in half the time required for servicing trains of refrigerator cars. Two 85-car trains can be serviced at one time under the new operation.

Idaho

Boise, Idaho—A new S & S ice vending station is being installed by Boise Ice & Produce Co. of this city.

Indiana

Aurora, Ind.—Home City Ice Co. recently completed installation of two new S & S ice vending machines to dispense both block and packaged ice.

Brazil, Ind.—Work has been started on a new building to house the Brazil branch of Peter Eckrich & Sons, large Fort Wayne meat packers.

Evansville, Ind.—Evansville Ice & Storage Co. plans to build another warehouse next to its present one at Ninth and Court Streets. The new building is needed to meet a growing demand for freezer space according to William S. Slieg, vice president and general manager.

Greenfield, Ind.—The Riley Ave. plant of the Greenfield Ice and Fuel Co. is being completely rehabilitated. A water treatment plant, which removes iron, lime and other minerals is being installed. Materials for 25 tons of ice will be purified by the system each day, the water being taken from a 172 foot well by the latest type turbine pump which delivers 75 gallons per minute. New coils have been installed in the ice storage room.

Indianapolis, Ind.—The Polar Ice and Fuel, 2000 Northwestern Ave. has installed and will continue to install ice vending machines throughout the Indianapolis area. Arrangements have been made by the Polar firm with the United Taxi Service to deliver any type of ice from the vending station nearest the customer's home, this service being available day or night.

Kentucky

Richmond, Ky.—Richmond Ice Co. is now offering large bags of processed ice to the local trade. Sales are handled 24-hours a day by S & S ice vending machines.

Massachusetts

Boston, Mass.—Just in time for Boston's tea parties, Boston Ice Co. has installed four S & S ice vending machines to serve the summer trade.

Maryland

Cumberland, Md.—The Speelman Ice Cream Co. will be enlarged in order to triple the facilities of the present plant at 148 Bedford St. The plant in addition to ice cream, handles frozen foods.

Michigan

Lansing, Mich.—Lansing Ice & Fuel Co. has in operation four new S & S ice vending machines, in order to serve ice users 24 hours every day. S & S of California manufactured the equipment.

Watervliet, Mich.—Work is almost completed on the expansion project which increases the cold storage capacity at the Watervliet Fruit Exchange. The expansion of the cold storage facilities will increase the capacity from the present 12,000 bushels to approximately 28,000 bushels. When the original compressor was installed, possible expansion was taken into consideration so that the present compressor will prove adequate.

Minnesota

Minneapolis, Minn.—Cedar Sanitary Ice Co. has installed additional I. & R. 8x solid Don M.-7 7-20-50 ;..... Lundale Avenue plant and also at the Wasica properties.

Missouri

Ste. Genevieve, Mo.—Rex Sexauer has opened his new and completely modern ice plant. Plans for building the new plant were announced in the May, 1950 issue of ICE AND REFRIGERATION. The new plant is located on Highway 25. Modern ice vending machines have been installed to give the customers 24-hour service.

St. Joseph, Mo.—Goetz Brewing Co. is constructing additional loading dock and storage facilities at the plant on Isabelle St. near Maple Leaf Blvd.

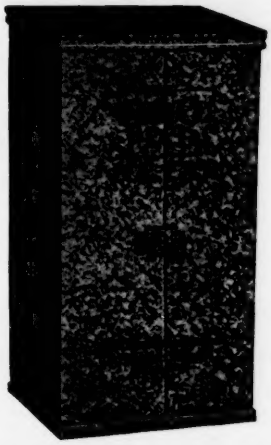
St. Joseph, Mo.—Artesian Ice Co. has installed three S & S ice vending machines to assist in meeting this summer's demand for block and processed ice.

St. Louis, Mo.—Anheuser-Busch, Inc. has completed a large portion of the post-war expansion of its St. Louis brewery. The capacity at the start of the program in 1947 was 310,000 barrels a month. With completion of the expansion, the brewery will be able to turn out 525,000 barrels a month.

Nebraska

Holdredge, Nebr.—Don E. Miller of the Quick Service Oil Co. has been granted a permit to build a steel structure to be used as an ice house for conducting an ice business here.

OHIO SPECIAL ICE CANS



Double Riveted
Welded
Integral Tube Cans
Arctic Pownall Cans
Can Baskets
Condenser Trough

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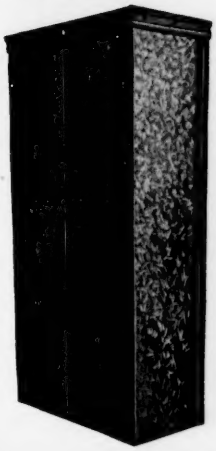
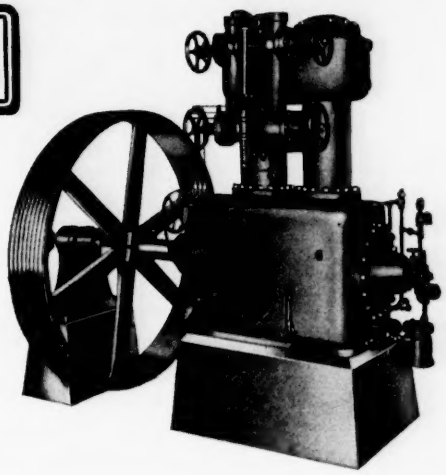
Industrial Trucks
and Trailers



THE OHIO GALVANIZING & MFG. CO.

NILES — Established 1902 — OHIO

Sterling DEPENDABLE REFRIGERATION



The phrase "STERLING DEPENDABLE REFRIGERATION" is more than a slogan—it's a fact.

Built with rugged strength for endurance, with advanced design for efficiency and economy of operation, STERLING Ammonia Compressors are the product of more than fifty years of "know how" in the manufacturing of refrigeration machinery and equipment.

A complete range of sizes insures the correct compressor for each application.

Deliveries are, at present, current—most models of compressors are available from stock.

For complete information, see your nearest STERLING distributor, or write the factory.

REYNOLDS MANUFACTURING CO.

SPRINGFIELD — *"Builders of Fine Refrigeration Equipment"* — MISSOURI

Red Cloud, Nebr.—The Valley Dairy has installed a new ice machine which will make both flake and cake ice and should supply enough for the community all summer.

Ohio

Cincinnati, Ohio—Three new S & S ice vending machines have been delivered to City Products Corp. The new units will dispense cubed, crushed, and block ice.

Cleveland, Ohio—Five new S & S ice vending machines are being made ready for the coming season by City Products Corp. of this city. All of the new units will be used to dispense packages of processed ice.

Hamilton, Ohio—The Valley Ice Co. this month has installed a new S & S ice vending machine for the automatic selling of bags of processed ice.

Lorain, Ohio—The Lorain Crystal Ice Co. has recently installed S & S automatic ice vending equipment.

Mansfield, Ohio—National Ice Co. of this city is now operating newly acquired S & S ice vending machines.

Oregon

Hood River, Ore.—A remodeling job at the Apple Growers association Van Horn cold storage plant, aimed at increasing the storage capacity while effecting necessary repairs, was announced recently by J. E. Klahre, general manager of the association. The remodeling will increase the cold storage space around 75,000 boxes.

Pennsylvania

Chambersburg, Pa.—A new $150,000 cold storage building is being constructed here to be used to store 300,000 bushels of apples for the Knouse Foods Cooperative.

DEATHS

Charles S. Borden

THE death of Charles S. Borden, president of S. S. Borden Co., Chicago, and secretary of the Central Cold Storage Co., occurred in Passavant Hospital, Chicago, July 11. Mr. Borden was also past president of the Mercantile Exchange, having served three terms. He is survived by a daughter, Mrs. Ruth B. Embree and a son, Seymour S. Borden, and three grandchildren.

WILLIAM THOMPSON, SR., former president of the Glenwood Coal & Ice Co., Philadelphia, Pa., died July 4 at the age of 88 years. Mr. Thompson was a Mason and a member of the Tioga Baptist Church.

JAMES HOWARD EDMONDSON, retired vice president of the Chicago Cold Storage Co., died July 6, at his home in Chicago. He leaves his widow, Mrs. Mary Sherill Edmondson and a son, Frazor T. Edmondson, Dallas.

John A. Hill

JOHN A. HILL recently retired owner of the Natick Ice & Oil Co., Natick, Mass., died July 13, at the age of 82. Mr. Hill had lived in Natick for 51 years, going there from his birthplace Economy, Nova Scotia. In 1948 he turned over the operation of his business interests to his two sons; John J. and Oliver B. Long active in town affairs he served for 15 years on the town finance board. He was a charter member of both the Rotary and Elks Clubs of Natick, a director of the Natick Federal Savings and Loan Association, president of the Natick Building Association. He was also a member of Meriden Lodge of Masons, Natick Commandery and the Masonic bodies and the Odd Fellows.

He was one of the founders of the Old Massachusetts Ice Association, and when the New England Ice Association was formed he became a charter member, serving as a director and later as president. He attended every convention of both the Old Massachusetts Association and the New England Association since such conventions were held. He also attended every convention of the National Association of Ice Industries since he entered the ice business.

Roy C. Weatherwax

ROY C. WEATHERWAX, president Acme Industries, Inc., Jackson, Michigan, died after an illness of several months, in Jackson on June 23, 1950.

Roy C. Weatherwax was a life-long resident of Jackson, Michigan, and one of the original incorporators of Acme Industries, Inc., in 1919. He was a well known industrialist. As a young man he was a member of the Holton-Weatherwax Co. and later was an organizer and member of several other industrial corporations.

Kenneth A. Weatherwax, who for many years has been associated in business with Roy C. Weatherwax and who for the last ten years has been executive vice-president, has been elected as president of the company. The policies of Acme Industries, Inc., and all present planning will continue under the new president.

Bern A. Duffner

AS a result of a stroke, Bernard A. Duffner, De Soto Dairy, Ice and Supply Co., De Soto, Mo., died July 5. Mr. Duffner was a member of the Missouri Ice Manufacturers Assn. He is survived by his widow Catherine, a daughter Mary E. Norris, three sons, Elmer F., George E., and Bern V. Duffner, and a sister and brother, Mary and Fred Duffner.

Glenn C. Hyde

GLENN C. HYDE, 68, prominent utility executive, died in Dallas, Texas, June 23. Following his graduation from Purdue University Mr. Hyde spent his entire life in the operation and management of utilities and ice companies and was widely

Glenn C. Hyde

known throughout these industries. At the time of his death he was President of the Gulf Public Service Co., Inc. of Louisiana. It was through his efforts and leadership that this Company was formed following the purchase and subsequent merger of the former Gulf Public Service Company and the Louisiana Public Utilities Co., Inc.

Charles S. Jacobowitz

CHARLES S. JACOBOWITZ, 72, life-long resident of Buffalo, N. Y., who headed three companies, died suddenly June 22. He headed the used machinery company at 3080 Main St. bearing his name, the Niagara Filter Corp. also at 3080 Main St., and Speedways Conveyors Inc., 1261 Niagara St.

When prohibition was enacted Mr. Jacobowitz achieved world-wide fame as a "brewery undertaker." He purchased approximately 200 breweries throughout the country and sold the machinery and equipment in every part of the world. While still in his teens, he became the owner of one of the first stores operating under the name of the Atlantic & Pacific Tea Co. He sold out his grocery store and went into the ice and coal business in 1905 at 1208 West Ave., Buffalo.

HERBERT CARLTON DOUP, former owner and operator of the Independent Ice Plant, Pine Bluff, Ark., and a resident of Pine Bluff for twenty years, died July 2. Mr. Doup also formerly owned the Doup Ice Plant at Little Rock.

PICKWELL ICE PICK VENDOR

Convenient Self Service Any Location

10c or 15c Vending

Made by the manufacturer of the nationally known BEN SPECIAL Ice Pick. Holds 21 fully assembled Ice Picks equipped with rust preventive, safety straws. Precision engineered for unfailing service. 10c Anti-slug mechanism. Electrically welded steel body for all weather operation. Exclusive quick action non-jamming PATENTED delivery. Weather resistant baked two-tone finish. Chrome plated mechanism. FULLY GUARANTEED. Double lock panel door. Separate lock for coin box.

Height: 31" — with stand 66". Width 9¼" — Depth 5¼". Shipping Weight — Machine: 24 lbs.; Stand 24 lbs.

	10c mech	15c mech.
1 only	39.50 ea.	44.50 ea.
2-9	37.00 ea.	42.00 ea.
10 & up	33.00 ea.	38.00 ea.
Stand Extra	15.00 ea.	

All prices f.o.b. our factory

Distributors Wanted

UNITED ICE SUPPLY CO.
55 BEVERLY ST., BOSTON 14, MASS.

BOWER
B B BRAND
AMMONIA

Purity of product and immediate shipment are two good reasons for specifying Bower Brand. Please keep empty cylinder rotating.

HENRY BOWER CHEMICAL MFG. CO. — B B BRAND — U.S.A.

Est. 1858

HENRY BOWER CHEMICAL MANUFACTURING COMPANY
29TH AND GRAY'S FERRY ROAD
PHILADELPHIA 46, PA.

KEEP IN TOUCH WITH

MODERN REFRIGERATION

This official organ of the British Refrigerating Industry incorporates the two original British Journals *"Cold Storage & Produce Review"* and *"Ice & Cold Storage"*. Now in its 52nd year. *"M.R."* gives the latest reliable technical and practical information.

Subscription, post free,.....$3.00 a year

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MODERN REFRIGERATION, Empire House, St. Martin's-le-Grand, London E.C.1., England.

POLAR ICE VENDING EQUIPMENT
NEW ADDRESS

In order to give you better service we are consolidating our sales office and factory.

EFFECTIVE JULY 1, 1950

all correspondence, telegrams and telephone calls should be directed to

REFRIGERATION ENGINEERING CO.
MONTGOMERY, MINNESOTA
P. O. Box 337 **Phone 213**

BRINE AGITATORS

ICE CAN FILLERS

PLAN NOW FOR YOUR FALL REQUIREMENTS

- **Tank Framing and Covers**
- **Raceway and Storage Room Coils**
- **Receivers and Surge Drums**

Plus many other components Estimates cheerfully furnished by our Engineering Dept., write

(REFRIGERATION ENGINEERING CORP.)
RECO PRODUCTS DIVISION
2020 NAUDAIN STREET, PHILA. 46, PENNA

ICE CAN DUMPERS

What's New

MACHINERY
APPLIANCES • PROCESSES

FlakIce Improvement "De-aerates" Ribbons

YORK Corporation's 1950 model FlakIce machine incorporates a "de-aerating" feature which according to John R. Herztler, vice president of the corporation "was designed primarily to help keep the 'zip' in carbonated beverages, although its translucent appearance makes it desirable for iced vegetable, and similar displays in stores and restaurants.

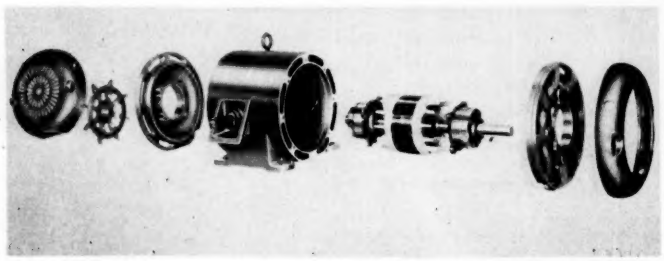
The new model, known as the DER-11, will contain all the features of the DER-10, which has the same capacity, a ton a day. It is designed to produce the same curved shape ice ribbons for contact chilling of foods.

The curved form of the ice prevents the ribbons from clumping together and because of their greater exposed surface area, this ice provides faster cooling of liqiuds.

New Wagner Cast Iron Frame Motors

THE Wagner Electric Corporation recently announced the development of a full line of cast iron frame totally enclosed fan-cooled motors which are available in ratings from 5 hp. through 250 hp. in both standard and explosion-proof designs. These cast iron frame motors are especially suitable for applications in many plants where corrosion is a problem, either because of the nature of the materials processed or because the motors must be installed outdoors.

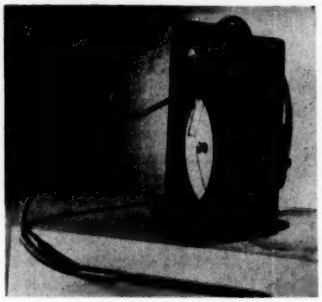
Construction details include cast iron frame; cast iron endplates; cast iron blower shield; corrosion resistant blower; cast iron conduit box; sealed leads; cartridge type ball bearings; completely protected laminations; special varnish winding treatment; cast aluminum rotor; drain plugs and corrosion resistant nameplate.



Exploded View of the Wagner cast iron frame motors.

Convertible Recorder

RECORDING temperatures and pressures under a variety of changing conditions is accomplished with a new 6 in. chart recorder measuring 8⅜ in. x ⅝ in. x 3¾ in., and weighing 7½ pounds, not including the tubing. Temperature and pressure systems of this recorder are interchangeable so that at any time the instrument may be converted from a temperature to a pressure recorder or vice versa, or changed in range of temperatures or pressures recorded.



Gotham Convertible Recorder

Convertibility does not stop with the temperature and pressure systems. The mounting brackets furnished are reversible so that the recorder may be flush or wall mounted.

These convertibility features will appeal to anyone who must keep his instrumentation costs low yet whose temperature and pressure recorder needs change from time to time. The cost of converting or changing the instrument is slight, and the instrument does not have to be returned to the factory.

Temperature system ranges cover from 40 to 1000 F. (or the equivalent in Centigrade); pressure system ranges cover from 0 to 5000 psi.

The bulb of the instrument is supplied with mercury, gas or vapor filling according to use. Size of the bulb depends upon the filling and the length of tubing actuated. The bulb shown in the illustration is mercury-filled, and made from stainless steel for use under corrosive conditions. In fact, the instrument illustrated also has a stainless steel bourdon tube, stainless steel movement and linkages, stainless steel capillary tube and protective armor.

Equipped with a handle and feet, the portable temperature instrument is used for measuring temperatures in ordinary rooms and refrigerated rooms, and for checking temperatures in refrigeration installations.

It is made by Gotham Instruments, Division of American Machine and Metals, Inc., 149 Wooster Street, New York 12, N. Y.

Portable Beverage Cooler

A PORTABLE beverage cooler known as the "Snackmaster" and made by the Acton Products, Inc., Arkansas City, Kans., is being introduced to ice distributors as a handy container for sized ice or ice cubes as well as a beverage cooler.

Standard Snackmaster Beverage Cooler.

It is made in two sizes. The standard size is 19 in. high, 17 in. long and 12 in. wide. It has removable sandwich tray which clamps onto the top and a drain provides for emptying of liquid. It has a capacity of 24 bottles. The junior size is 14 in. high, 11½ in. long and 9 in. wide. It has capacity for 12 bottles. Both sizes are finished in green baked enamel outside and galvanized inside the tank.

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

★ *Saves Space*

★ *Saves Weight*

★ *Saves Cost*

CAN BE USED WITH ANY REFRIGERANT
SALES AGENCIES SOLICITED

Manufactured by

DETROIT ICE MACHINE COMPANY
2615 Twelfth St., Detroit 16, Mich.

Keg Shipping Room — Pfeiffer Brewing Co., Detroit, Mich. Cellars throughout the brewery also equipped with DIMCO fin coils.

THE INDEX LINE
ICE DEALERS SUPPLIES

Only the Highest Quality Merchandise and efficient service necessary for the proper and profitable operation of your business. Write for our 1950 catalog.

INDEX COUPON AND SUPPLY COMPANY
LA PORTE, INDIANA

INCREASE YOUR PROFITS

Happy Says—
YOUR PROFITS JUMP WITH—

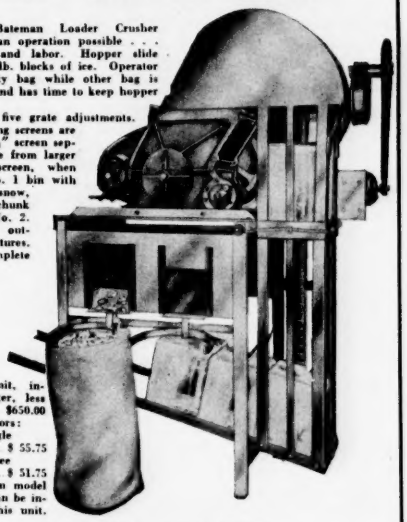
"HAPPY" ICEMAN prefers
MASTER POINT ICE PICKS

MASTER POINT ICE PICKS
SOLD THRU THE NEW
"TAKE-A-PICK" MASTER POINT PICK VENDOR
WRITE OR WIRE
HALSEY MFG. CO., Evansville 2, Ind.

AUTOMATIC LOADER CRUSHER
Saves TIME and LABOR!

Automatic Bateman Loader Crusher makes one-man operation possible . . . saving time and labor. Hopper slide holds five 50-lb. blocks of ice. Operator replaces empty bag while other bag is being filled, and has time to keep hopper loaded.

Crusher has five grate adjustments. Two new sizing screens are furnished. ⅜" screen separates fine ice from larger size. ¾" screen, when used, fills No. 1 bin with pea-size and snow, leaving clean chunk ice in Bin No. 2. Many other outstanding features. Write for complete information.



Complete unit, including bagger, less motor $650.00
Crusher Motors:
¾ H.P. Single Phase ..... $ 55.75
¾ H.P. Three Phase ..... $ 51.75
Any Bateman model 50 crusher can be installed on this unit.

All Inquiries Answered Promptly

BATEMAN FOUNDRY & MACHINE CO., INC.
MINERAL WELLS, TEXAS

NOZZLES • DROP TUBES • CAN DOGS • CAN FILLERS • BLOWERS • BRACKETS • BAGS • HOISTS

• ICE CRUSHERS •

THE BEST THAT MONEY CAN BUY

Place your orders for air agitation equipment with us and be assured of receiving precision-machined parts, thus enabling you to make the very best clear raw water ice possible.

We have been serving the ice industry for 15 years and our customers know that although priced conservatively, our equipment can be depended on for satisfactory performance and economic operation.

It will pay you to investigate our facilities.

ICE PLANT EQUIPMENT CO., Inc.

WRITE OR TELEGRAPH **2543 Frankford Ave.** **Philadelphia 25, Pa.** TELEPHONE NEbraska 4-3055

• RUBBER TUBING •

TUBE CLEANERS • PUMPS • FILTERS • VALVES • ICE TONGS • THERMOMETERS • ICE PICKS

New Instrument Measures Heat Conductivity

THE development of a portable instrument capable of determining the thermal conductivity of wet or dry solids within ten minutes was reported to the American Society of Heating and Ventilating Engineers at its semi-annual meeting. The brief duration of the test allows the material to be tested under unchanging moisture conditions, the American Society of Heating and Ventilating Engineers was told.

The instrument, an electrically heated probe, was developed at the University of Toronto primarily to measure the thermal conductivity of moist soils but it has been applied successfully to other materials such as building materials and insulation. It was developed by F. C. Hooper, lecturer in mechanical engineering, and F. R. Lepper, research student in mechanical engineering, University of Toronto.

The project is being extended at the University of Toronto in two directions: (1) more data are being accumulated both in the field and in the laboratory on the thermal conductivities of various materials, including rocks and frozen soils and (2) a smaller instrument is being developed for use in the direct determination of thermal conductivity of meats, vegetables and other foodstuffs, particularly those normally stored by cooling or freezing.

They cited the following advantages:

It will measure with equal precision the thermal conductivity of wet or dry materials.

It will permit the testing of materials such as soils, in natural location, and consequently structurally undisturbed.

The apparatus is compact and portable. It is relatively inexpensive to construct and operate.

A determination can be made in a few minutes, and the operator requires only limited training. The required calculations are very simple. The method is suited to production control application.

The precision appears adequate for engineering use.

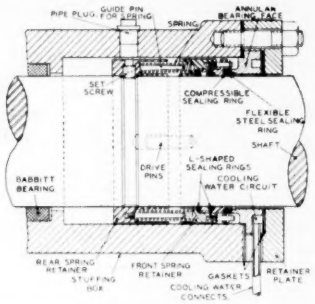
Mr. Hooper and Mr. Lepper reported that the instrument has given very good results in tests of both wet and dry soils, sawdust, corkboard, silica gel and similar materials. Fiber insulating materials of very low density have given somewhat erratic results, they said, possibly due to non-homogeneity in the specimen or to convection currents arising in the interstices. They added that except in this material no evidence of contact effects has been found. Results have been reproducible within .5 percent.

The instrument consists of an aluminum tube, inside of which there is an axial constantan electrical resistance wire, insulated over its length and grounded to the tube at the lower end. An electrical current can be passed through this wire to provide a heat source of constant strength. The lower end of the tube is closed by a pointed plug. The resistor leads are taken out through a seal at the upper end.

Within the tube, and near the center of its length, are located the hot junctions of several thermocouples. These junctions are connected in series with external cold junctions to give temperatures by potentiometer measurements. The thermocouple leads are also taken out through the seal at the upper end of the tube.

Flexo-Seals Standard Frick Equipment

FLEXO-SEALS are now standard equipment on Frick enclosed type Freon coils and booster compressors. These seals operate without tension or adjustment and hold Freon 12 or ammonia just as satisfactorily in the automatic plant as with an engineer present. They work equally well under pressure or under vacuum. They provide an answer to the problem of preventing either leakage or overheating where the shaft extends through housing of the enclosed type of refrigerating machinery. Tests have been made, it is claimed, showing that the Flexo-Seal saves up to one per cent in the horsepower required for driving a compressor, over that required for the usual stuffing box and soft packing.



Cross-section drawing showing parts of the Frick Flexo-Seal.

Goulds Offers New Self-Priming Pump

A NEW line of self-priming centrifugal pumps is offered by Goulds Pumps, Inc., Seneca Falls, N. Y. These new pumps give unique advantages in self-priming applications. For example, all valves are eliminated by the unusual design. Other advantages are: Positive self-priming,

New Gould self-priming pump.

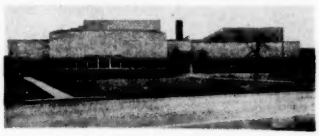
no large and bulky priming reservoir, no recirculation of water during pumping stage, and efficiencies comparable to standard centrifugal pumps.

Patents are pending on the new design. Made in sizes from ¼ to 5 hp, open and closed impellers. Capacities to 120 gpm and heads to 135 feet depending on capacity. Suction lifts up to 25 feet. For more complete information, write Goulds Pumps, Inc., Seneca Falls, New York, for Bulletin 636.1.

MANUFACTURERS' NEWS

Industrial Filter & Pump Moves to Larger Plant

THE general offices and plant of the Industrial Filter & Pump Manufacturing Co., has moved from 1621 West Carroll Ave. to a newly acquired location at 5900 Ogden Ave., Chicago 50, Ill. The much larger manufacturing space provides facilities to meet the increasing demand for the company's filters, demineralizers, heat exchangers, corrosion test cabinets, unit spray washers, vulcanized linings, and molded-rubber products. This new plant will enable the company to better its service to its customers.



New Plant of Industrial Filter & Pump Manufacturing Co., Chicago, Ill.

Named Assistant General Service Manager

RALPH L. BEACH, a native of Chanute, Kansas, who has been associated with York Corporation, York, Pa., since his graduation from Kansas State College in 1926, has been promoted to assistant general service manager, according to John R. Hertzler, Vice-President and General Sales Manager.

Ralph L. Beach

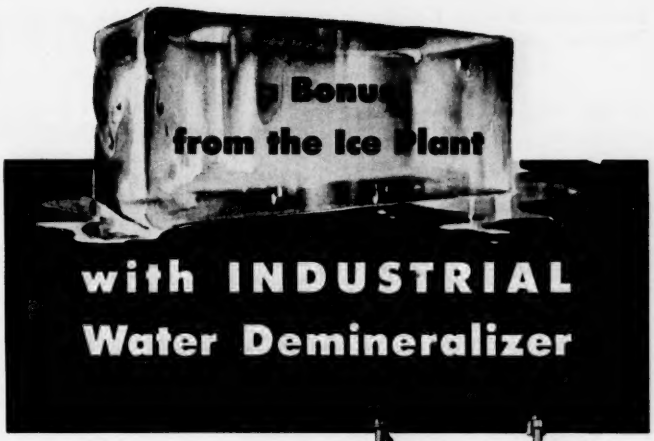
Prior to his new assignment, Beach had been serving as Engineer Manager and District Engineer of York Corporation's Southern District at Atlanta, Ga. Hertzler said that Beach, well-known throughout the entire York organization will assist Roger H. Dowling, General Service Manager, in guiding the firm's extensive service organization.

Hallowell with Refrigeration Parts Wholesaler

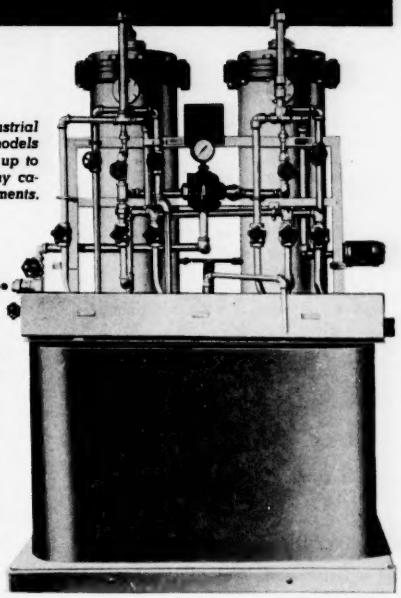
ELLIOTT R. HALLOWELL, former vice-president in charge of engineering for the Alford Refrigerated Warehouses, Dallas, Texas, is now associated with the Snell Refrigeration Supply, Dallas, Texas, as chief engineer.

Elliott R. Hallowell

Mr. Hallowell, a graduate engineer, was associated with Frick Co., Waynesboro, Pa., and Central Engineering and Supply Co., Dallas, prior to his position with the Alford Company.



A typical two-bed Industrial Water Demineralizer. Standard models available with capacities up to 1000 gph. Special units of any capacity engineered to requirements.



Here's how it works...

Instead of running ordinary city water into the freezing tanks, it is passed through the Industrial demineralizer where beds of ion-exchange resins remove the dissolved mineral salts—delivering the chemical equivalent of pure water.

With this pure water there are no minerals to deposit in the core—so the whole core-pulling operation is eliminated. Furthermore, the amount of ice which cracks in the cans is appreciably reduced. And the transparency of the whole cake is improved—your customers will notice the difference and like it.

It's easy to find out how to get this big bonus from your ice plant. Send us an analysis of the water you are using, the quantity you need, and at what rate (gallons per hour). We will send you complete information on demineralized water, estimate of costs, performance data, etc. Better look into it right away.

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

5914 Ogden Avenue
Chicago 50, Illinois

RUBBER DIVISION
Vulcanized Linings • Molded Products

WATER DEMINERALIZERS

CATALOGS AND BULLETINS

Thompson Heads Kinetic Division of Du Pont

C. DOUGLAS PORCH, president of Kinetic Chemicals, Inc., long a Du Pont Company affiliate, retired July 31. Mr. Porch has been with Du Pont and Kinetic Chemicals for more than 43 years. It was announced at the same time that operations of Kinetic, wholly owned by Du Pont since last December 30, has been integrated with those of the company's Organic Chemicals Department on July 1.

A new Kinetic Chemicals Division will be set up to handle sales of Kinetic products, the "Freon" fluorinated hydrocarbons used principally as refrigerants and aerosol propellants. The division will be headed by Robert J. Thompson as director of sales and Emory M. Fanning as assistant director.

With a background of refrigeration engineering dating from his association in 1919 with a General Motors Corporation program for the development of electric refrigerators, Mr. Thompson came with Kinetic in 1931. He took part in the development and commercial introduction of "Freon" fluorinated refrigerants, was made Kinetic's technical sales manager in 1945 and, a few years later, was promoted to sales director.

As a design engineer, he participated in the trials which launched the Frigidaire and, in 1927, was selected to organize the European branch of the business, later traveling extensively in South Africa and the Middle East on a similar mission.

The manufacture of "Freon" compounds will be in charge of Stuart W. Pratt as production manager. He will be a member of Organic Chemicals' production organization.

Concrete Floor Repairs

AN IRON asphalt patching material which produces long life repairs and makes possible easy, fast patching or resurfacing of worn concrete floors has been announced in a new 8-page illustrated bulletin by The Master Builders Co. of Cleveland. Copy of bulletin containing complete directions supplied on request.

According to the manufacturer, this material named Masterquick overcomes the problem of early break down under impact, particularly of feather edges, encountered with ordinary asphalt patching materials.

The ability of Masterquick to withstand impact results from the application of a principle which for years has been responsible for long life in concrete floors subjected to heavy traffic. Use of scientifically graded, ductile, metallic aggregate in place of brittle aggregates insures a long life patch or resurfaced floor by overcoming crushing and spreading of repair material, which breaks the bond.

New Universal Catalog

ALL types of industrial metal hose, tubing and fittings for conveying solids, fluids or gases at elevated pressures and temperatures are described and illustrated in the new 12-page No. U-101 Catalog recently issued by Universal Metal Hose Company of Chicago.

Typical pages in new Universal Metal Hose Catalog

Typical applications for each hose classification are listed. Specifications are complete and organized for easy reference. Cross-section photos give close-ups of construction detail. Covered in the catalog are Universal square-locked flexible tubing, interlocked flexible hose, seamless flexible hose, diesel engine exhaust hose, hose assemblies, and couplings.

Diameters range from ⅛ to 30 in. in standard metals, including stainless steel, monel and other new alloys. The back page of the catalog is designed to serve as an inquiry blank with space to list specification requirements.

Copies may be obtained by writing Universal Metal Hose Company, 2133 South Kedzie Avenue, Chicago 23, Ill.

New Company Publication

THE "Bower Digest" has been issued by The Henry Bower Chemical Mfg. Co., to present summaries of significant articles appearing in current issues of leading trade journals serving the refrigeration industries. ICE AND REFRIGERATION is honored in the first issue with summaries of articles on mechanized car icer, vending depots and report on the Eastern States Ice Association. Digests of other articles include figures on dairy, meat, and soft drink production, frozen shrimp, and frozen concentrated milk, ice cream production, preventing milk flavors, meeting of council on research of the American Meat Institute and the national beverage exposition.

Pipe Nipples In Standard and Assorted Packages

CHICAGO Nipple Manufacturing Company, Cicero 50, Ill., which makes pipe nipples and other types of piping equipment, recently produced a small four-page folder describing the standard lengths and diameters of pipe nipples that are available in standard and assorted packages which comply with United States Department of Commerce, Bureau of Standards Specifications CS 5-46 Addenda. As a service to agents and distributors, the company offered to supply copies of this pamphlet in quantities with individual company imprints for distribution to their customers.

The response was both spontaneous and tremendous, for within a week after the offer was made to distributors and agents, orders were received aggregating 75,000 copies from dealers and representatives.

R. H. Sonneborn, General Sales Manager of the company, stated he was "most pleasantly surprised with the response that had been received to this piece of promotion work," and "feels from expressions contained in letters requesting copies, that the company obviously is supplying a valuable service to industry by presenting information in this form."

Sanitation Bulletin

"GOOD Sanitation is Good Business" is the title of a new booklet just issued by the James Laboratories, Chicago. The book describes the activities of an unusual inspection-laboratory service geared to the specific requirements of plants engaged in food processing, manufacturing and warehousing. Manufacturers and processors interested in outside help on sanitation problems are invited to write for this booklet to The James Laboratories, 189 West Madison Street, Chicago 2, Illinois.

Valve and Fitting Catalog

CYRUS SHANK CO., 625 W. Jackson Blvd., Chicago, Ill., pioneer valve and fitting manufacturer has issued a new catalog illustrating and describing refrigeration valve products which the company has specialized in since 1912.

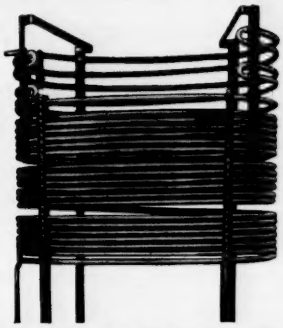
The catalog covers ammonia shut off line valves, gauge sets, relief valves and accessories, fully described and illustrated. Specification, including pipe sizes for various applications are included. Copies may be obtained from the Cyrus Shank Company.

PITTSBURGH
Air Pressure Tested COILS

Electrically welded, continuous; Air-Pressure-Tested while submerged in water. Built to your specifications. Send for new Coil Data Book and let us quote.

Welded Headers—Welded Ammonia Receivers
Accumulators—Pipe Coils—Bends—Boilers Tubes

Pittsburgh Pipe Coil & Bending Company
61 BRIDGE STREET, ETNA, PITTSBURGH 25, PA



CEMCO

Double Gig Ice Hoist
Fast - Sturdy -
Dependable -

Send for details

THE CAPITAL ELEVATOR & MFG. CO.
424 W. Town St.
Columbus 8, Ohio

LITTLE GIANT
ICE BREAKERS

- *SAVE TIME*
- *SAVE LABOR*
- *SAVE ICE*

12 MODELS TO CHOOSE FROM
Write for Descriptive Circular

MODEL W-90-M
ADJUSTABLE GRATE—For TRUCK MOUNTING

MICRON, INC., Dept. I
BETTENDORF, IOWA

Head Pressure REDUCED by 50 lbs.

Carnation Company
Fresh Milk and Ice Cream Division
December 26, 1947
Rex Engineering & Sales Co.
Oklahoma City, Oklahoma
Gentlemen:
Referring to your letter of December 18th will say we are very much pleased with the Rex Air Purger recently purchased and installed at our Ice Cream Plant.
We have reduced our head pressure by fifty pounds.
We are now installing a smaller size Rex Purger in our Fresh Milk Unit.
Yours very truly,
Howard A. Bennett, Chief Engineer

REX AIR PURGER

Here's proof of actual results with a Rex Air Purger. When you purge your refrigeration system of non-condensable and permanent gases you reduce head pressure and lower power costs. Investigate today—Write Dept. IR.

REX ENGINEERING & SALES CO.
Oklahoma City, Oklahoma
BOX 5141

VAN RENSSELAER H. GREENE
ENGINEERS

COMPLETE PLANT DESIGNS INCLUDING
BUILDING AND EQUIPMENT

11 PARK PLACE **NEW YORK 7, N.Y.**

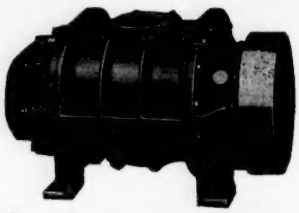
FRED OPHULS & ASSOCIATES,
Consulting Engineers
112-114 WEST 42nd ST. NEW YORK CITY 18
Ice Making and Refrigeration - Industrial Power Plants
Reports, Appraisals and Management

VIVIAN SERV-ICE TRADE MARK REG. U.S. PAT. OFF. Products
ICE TOOLS AND SUPPLIES

WE CONTINUE YEAR AFTER YEAR
to make the kind of Ice Picks that will give YOUR customers satisfaction and build up GOOD WILL FOR YOU.

PRICE UPON REQUEST

VIVIAN MANUFACTURING CO. **4132-38 Folsom Ave., St. Louis 10, Mo.**



For Exact Air Volume ...Install R-C BLOWERS

Many years of dependable performance have made R-C Blowers the preference of experienced ice plant operators. That's because hot or cold, wet or dry, in peak seasons or out, R-C Blowers can be depended upon to deliver a constant volume of air at rated capacities.

Simple, sturdy construction and moderate speed assure continuous, long-time service and low power cost. When planning replacements or additions to capacity, write us your requirements or ask for Bulletin R-C 1247.

ROOTS-CONNERSVILLE BLOWER Corp.

508 Columbia Avenue Connersville, Indiana

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

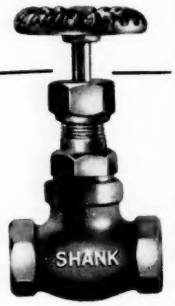
SHANK

REFRIGERATION PRODUCTS

Recognized as The Symbol of Quality

3-WAY DUAL SHUT-OFF VALVE

For use where Refrigeration Codes require dual relief valve installations. Stainless steel stem. Indicator plate on hand wheel shows position of valve shut off. Completely rust-proofed.



SEMI-STEEL SHUT-OFF VALVE

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THE BUYERS

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Vogt Machine Co., Henry, Louisville, Ky.

AIR AGITATING SYSTEMS AND FITTINGS
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.

AIR COMPRESSORS
Baker Refrigeration Corp. So. Windham, Maine
Frick Co., Waynesboro, Pa.

AIR CONDITIONING EQUIPMENT
Baker Refrigeration Corp. So. Windham, Maine
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N.Y.
Refrigeration Engineering, Inc. Los Angeles, Calif.

AIR PURIFYING EQUIPMENT
General Ozone Corp., Chicago, Ill.

AMMONIA COMPRESSOR VALVES
Frick Co., Waynesboro, Pa.
Voss, Inc., J. H. H., New York, N.Y.

AMMONIA COMPRESSORS
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Creamery Package Mfg. Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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AMMONIA FLOAT VALVES
Acme Industries, Inc., Jackson, Mich.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

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Bower Chemical Mfg. Co., Henry, Philadelphia, Pa.
du Pont de Nemours & Co., Inc., E. I., Polychemicals Dept., Wilmington, Del.

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Acme Protection Equipment Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.

AMMONIA PURIFIERS
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Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

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Baker Refrigeration Corp., So. Windham, Maine
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Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. F., Ridgefield Park, N. J.
National Pipe Bending Co., New Haven, Conn.
Pittsburgh Pipe Coil & Bending Co.,
Rempe Company, Chicago, Ill.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Shank Co., Cyrus, Chicago, Ill.

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Ophuls & Associates, Fred, New York, N. Y.

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Frick Co., Waynesboro, Pa.
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Rex Engineering & Sales Co., Oklahoma City, Okla.

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Index Coupon & Supply Co., La Porte, In.
International Paper Co., New York, N. Y.
Union Bag & Paper Corp., New York, N. Y.
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Vogt Machine Co., Henry, Louisville, Ky.

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Lamson Corp., Syracuse, N. Y.
Refrigeration Engineering Corp., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

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Vogt Machine Co., Henry, Louisville, Ky.

BOILER TUBES
Byers Co., A. M., Pittsburgh, Pa.

BOOKS—TECHNICAL
Nickerson & Collins Co., Chicago, Ill.

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CALCIUM CHLORIDE
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Gifford-Wood Co., Hudson, N. Y.
The Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

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Byers Co., A. M., Pittsburgh, Pa.
Chicago Nipple Mfg. Co., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Pittsburgh, Pa.

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Frick Co., Waynesboro, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
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Refrigeration Engineer Co., Montgomery, Minn.

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COMPRESSORS
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(See Air Compressors)

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Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
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Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

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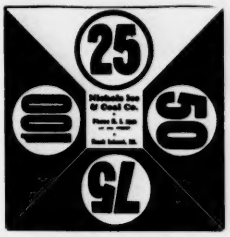

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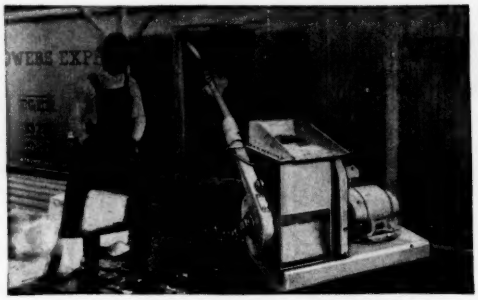

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THE BUYERS

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Link-Belt Co., Chicago, Ill.

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The Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

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(See Architects and Engineers)

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Frick Co., Waynesboro, Pa.

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Refrigeration Engineering, Inc., Los Angeles, Calif.

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Refrigeration Engineering, Inc., Los Angeles, Calif.
Vogt Machine Co., Henry, Louisville, Ky.

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Rempe Company, Chicago, Ill.

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Vogt Machine Co., Henry, Louisville, Ky.

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Howe Ice Machine Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

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Rempe Company, Chicago, Ill.

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Refrigeration Engineering Corp., Philadelphia, Pa.
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Ohio Galvanizing & Mfg. Co., Niles, Ohio
Refrigeration Engineering Corp., Philadelphia, Pa.

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United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Link-Belt Co., Chicago, Ill.
Refrigeration Engineering Corp., Philadelphia, Pa.

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Gifford-Wood Co., Hudson, N. Y.
The Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Refrigeration Engineering Co., Montgomery, Minn.
United Ice & Oil Supply Co., Boston, Mass.

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The Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
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International Paper Co., New York, N. Y.
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Union Bag & Paper Corp., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Gifford-Wood Co., Hudson, N. Y.
Link-Belt Co., Chicago, Ill.

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United Ice & Oil Supply Co., Boston, Mass.

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Detroit Ice Machine Co., Detroit, Mich.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Company, Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
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Refrigeration Engineering Corp., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Vivian Mfg. Co., St. Louis, Mo.

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United Ice & Oil Supply Co., Boston, Mass.
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United Ice & Oil Supply Co., Boston, Mass.

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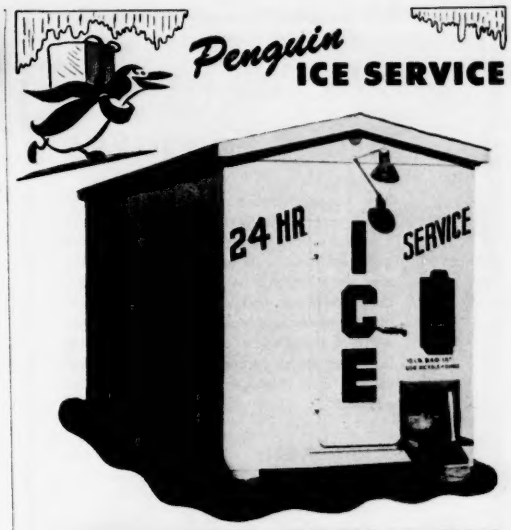

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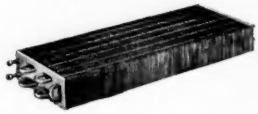

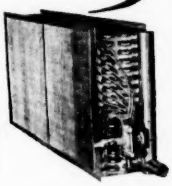

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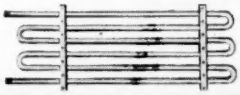

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Acme Protection Equipment Co., Chicago, Ill.

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The Moto-Truc Co., Cleveland, Ohio

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Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

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Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

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Rex Engineering & Sales Co., Oklahoma City, Okla.

OILS, FUEL
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Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

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Vivian Mfg. Co., St. Louis, Mo.

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The MotoTruc Co., Cleveland, Ohio

PIPE COILS AND BENDS
Acme Industries, Inc., Jackson, Mich.
Chicago Nipple Mfg. Co., Chicago, Ill.
Frick Company, Waynesboro, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Pittsburgh, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

PIPE COVERING
(See Coverings, Pipe and Boiler)

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National Pipe Bending Co., New Haven, Conn.
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PIPING
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Byers Co., A. M., Pittsburgh, Pa.
Frick Company, Waynesboro, Pa.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Pittsburgh, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

PRESSURE BLOWERS
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PROPELLERS
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.

PUMPING MACHINERY
Aurora Pump Co., Aurora, Ill.
Deming Co., The, Salem, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Layne & Bowler, Inc., Memphis, Tenn.
Refrigeration Engineering Corp., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PUMPING MACHINERY—AIR LIFT
Deming Co., The Salem, Ohio
Roots-Connersville Blower Corp., Connersville, Ind.

PUMPS, AMMONIA AND BRINE
Baker Refrigeration Corp., So. Windham, Maine
Deming Co., The, Salem, Ohio
Frick Company, Waynesboro, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Vogt Machine Co., Henry, Louisville, Ky.

PUMPS, DEEP WELL
Aurora Pump Co., Aurora, Ill.
Deming Co., The, Salem, Ohio
Layne & Bowler, Inc., Memphis, Tenn.

PUMPS, ROTARY
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Deming Co., The, Salem, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

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Armstrong Machine Works, Three Rivers, Mich.
Frick Company, Waynesboro, Pa.
Rex Engineering & Sales Co., Oklahoma City, Okla.

RAW WATER FREEZING SYSTEMS
Frick Co., Waynesboro, Pa.
Ice Plant quipment Co., Inc., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

REBOILERS
Frick Company, Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Dickinson & Co., F. B., Des Moines, Ia.
Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.
Towal Mfg. Co. Inc., Marion, Ill.

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SCORING MACHINES
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Gifford-Wood Co., Hudson, N. Y.
The Lilly Co., Memphis, Tenn.
Perfection Ice Scoring Machine Co., Fort Worth, Texas
United Ice & Oil Supply Co., Boston, Mass.

SECOND HAND MACHINERY AND SUPPLIES
Enterprise Equipment Corp., Yonkers, N. Y.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
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Vogt Machine Co., Henry, Louisville, Ky.

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Index Coupon & Supply Co., La Porte, Ind.
The Lilly Co., Memphis, Tenn.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
The Lilly Co., Memphis, Tenn.
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National Pipe Bending Co., New Haven, Conn.

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WATER SUPPLY CONTRACTORS
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WROUGHT IRON PIPE
Byers Co., A. M., Pittsburgh, Pa.

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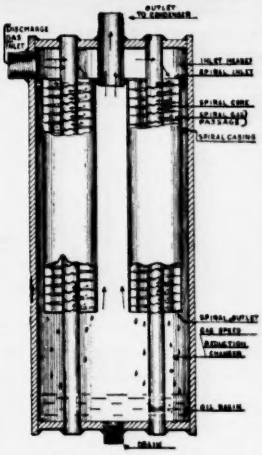
"King Zeero"
OIL SEPARATOR
STOPS OIL FROM ENTERING CONDENSER RECEIVER AND LOW SIDE



Allows operation as was originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

When used in connection with air compressors, water is also separated with the oil.

Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY
1447-55 Montrose Ave., Chicago 13, Ill.

Your Assurance of Best Quality
REFRIGERATION COILS
made by The National
PIPE BENDING COMPANY

All features that you demand are furnished regularly in National Pipe Bending Refrigeration coils—smooth bends, perfect welds, measurements exact.

For long service specify coils by the National
Pipe Bending Co.
Established 1883
162 River St., New Haven, Conn.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for the purchase and sale of USED equipment, existing and used plants, and surplus material or equipment.

RATES: $3.50 for 50 words or less; 60c for each additional 10 words or fraction thereof; 75c per line for bold face headings; $6.00 per inch on three column page ($9.00 per inch on two column page) for ads all set in bold face type or listing items on separate lines.

POSITIONS AND HELP WANTED

WANTED — Salesman calling on the Ice Plant trade on the West Coast and Mid-Western states to take on a side line of ice picks, blades and ice pick vending machines. United Ice Supply Co., 55 Beverly St., Boston 14, Mass.

PLANT OR POSITION WANTED—by licensed engineer experienced industrial, public utilities, refrigeration and cold storage. Sober and reliable. Now chief of medium sized plant. Available usual notice. Prefer employment with opportunity to lease plant when mutually satisfied. Address Box AU-3, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

ICE PLANTS—wanted & for sale

WANTED—Am interested in purchasing a 5 to 10 ton raw water ice plant to be moved. E. W. Ganster, 209 W. Penn St., Whittier, Calif.

FOR SALE—Complete 27 ton York ice plant to be moved; can be seen in operation until September 1950; equipment in excellent condition, includes float control, 324 ice cans, one 8x8 compressor, one 6x6 compressor, new scoring machine. Price $6000.00. Murphysboro Ice & Cold Storage Co., Murphysboro, Ill.

FOR SALE—25 ton ice plant in a thriving Ohio town. No ice competition. City of 15,000. Includes a large coal yard. Reason for selling, old age. Pays 15% net on price asked. Send for photos and details. Will carry large part of purchase price. Address Box 204, Ashland, Ohio.

FOR SALE—224 can York ice plant, electric with double hoist and filler, six trucks, large storage, scoring machine and sizer. Shoe repair shop to get you through the winter. Property located on very valuable lot. Property and equipment appraised at $64,865.00; will take $55,000.00 cash. Inspection invited. Steele Ice Co., Jackson, Mississippi.

FOR SALE—2 new Zenith portable ice-manufacturing machines capable of making twenty 300-lb. cakes of ice each 24 hours. 10 h.p. compressors mounted on platform with heavy, insulated box. Complete with cans, hoist, can-lifter and track, cuber, crusher and Refinite de-ionizers, ready for installation. For price and other terms contact Charles M. Bump, Trustee, 505 Central National Bldg., Des Moines, Iowa.

FOR SALE—30 TON ICE PLANT

This plant, in excellent condition, includes the following: Ice tank and auxiliary equipment, ice tank 16 cans wide by 24 cans long, 400—48"x11"x22" ice cans, Frick "Vertiflow" ice tank coil containing 1221 sq. ft. cooling surface complete with accumulator and float valve; all ice cans in four can grids; oak tank covers; Frick F. PR low pressure air system; 5 h.p. vertical agitator; centrifugal type air blower; one ton electric ice tank hoist and crane; Frick core sucking set; Knickerbocker 4 can, can filler; Frick hydraulic four can dump. High Side equipment including Frick 60 ton M S horizontal shell & tube condenser, 30 ton Frick vertical shell & tube condenser, receiver and oil traps. Compressors including Frick 8x8 with flexible coupling, Frick 7x7 with 50 h.p. motor, Frick 5¼x4 booster with 7½ h.p. motor. Will sell as a unit or in parts. Address The Ohio Valley Baking Company, Middleport, Ohio.

USED MACHINERY—wanted & for sale

AMMONIA COMPRESSORS

Brand new Worthington 3"x3", 5"x5", 6"x6", and 7"x7". Available at 50% discount from list. Immediate delivery. Subject to prior sale. Write or wire Reco Products Division, 2020 Naudain Street, Philadelphia 46, Penna. Telephone — Kingsley 5-3630.

USED MACHINERY—continued

WANTED—We are interested in a good used ice blower, complete. Write to Illinois Ice & Coal Company, 107 Metropolis St., Metropolis, Ill.

FOR SALE—7x7 Sterling ammonia compressor with 40 h.p. Westinghouse motor Vee belt drive; used 6 months; like new. Bicknell Ice & Coal Co., Bicknell, Ind.

FOR SALE—"Perfection Special" ice scoring machine, handles either 300 or 400 pound cakes. Excellent working condition. Buyer can see machine in operation. Priced at $395.00 F.O.B. Pueblo. WANTED—Snow ice blower that will handle 400 pound cakes. Forbush Company, 110 Grand Ave., Pueblo, Colo.

FOR SALE—Natural ice harvesting machinery, equipment and tools. We have discontinued our natural ice harvesting, therefor we have everything you need for cutting and storing natural ice. Priced at 25% of original cost plus dismantling and carting. Utica City Ice Corp., 65 Wurz Ave., Utica, N. Y.

FOR SALE—York and Arctic 9x9 compressors, York 5x5, Frick 6x6, Baker 4½x5. Small Lipman units, 288 Arctic Pownall ice cans; shell and tube condenser and brine cooler; ammonia receivers; 5 h.p. vertical agitator; 3 h.p. Hoffman blower; coils, fittings; 150 and 180 h.p. oil engines; generators, motors. Parke Pettegrew & Son Co., 370 W. Broad St., Columbus 8, Ohio.

FOR SALE—One 6¾"x5" V/W York ammonia booster compressor 8 cylinder V-belt drive complete with base, including 440 volt A.C. motor and 36"x 12' long D.E. gas and liquor cooler plus valves. This equipment is new and has never been installed. If interested contact W. A. Moore, General Manager, New Orleans Cold Storage & Warehouse Co. Ltd., 305 Gaiennie St., New Orleans, La.

FOR SALE—One 10 h.p. Frick Freon condensing unit. Six Freon suspended type Acme blowers. Two 3x3 Frick and one 4x4 York self-contained units. 3x3, 4x4, 5x5, 6x6, 7½x7½, 8x8 and 9x9 York splash lubrication compressors. One 2 h.p. vertical agitator. Four 3" flanged angle valves. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—Compressors; York 9x9, 7½x7½; 5x5, 4x4; Frick 10x10, 5x5, 4x4; Vilter 7½x7½; other sizes and makes at reduced prices. 400 lb. ice cans 11½x22½x57, guaranteed, $4.00 each. Ice tongs, Boston type, 3 pairs $1.00. Ice cuber, electric operation Other ice and refrigeration equipment. Write or wire us your requirements. Gordon Equipment Co., 6530 W. Jefferson Ave., Detroit 17, Mich.

FOR SALE—ICE PLANTS AND EQUIPMENT

1—30 ton York ice making plant, trunk coil, 4 can pull electric driven.
1—25 ton York ice making plant, brine coolers, electric driven.
1—12 ton York ice making plant, trunk coil electric driven.
2—10x10 Frick ammonia compressors, direct connected to synchronous motor.
1—10x10 York ammonia compressor, late type 360 r.p.m.
1—10x10 York ammonia compressor 250 r.p.m.
1—9x9 York ammonia compressor 250 r.p.m.
1—9x9 York ammonia compressor 200 r.p.m.
1—8x8 Frick ammonia compressor, late type with capacity control valves.
1—8x8 Frick ammonia compressor 277 r.p.m.
1—7x7 Worthington 400 r.p.m.
2—6½x6½ York high speed ammonia compressors, late type.
1—6x6 York 300 r.p.m.
1—5x5 York late style self contained unit.
Assorted brine coolers and condensers ASME coded vessels, like new.

B & E REFRIGERATING CO.
2 Orange St., Newark 2, N. J.
Phone: Mitchell 3-7790 Cable Address "BERECO"

USED MACHINERY—continued

FOR SALE

Equipment that has had but little use and is in unusually good condition.
6½x6½ two cylinder York vertical single acting ammonia compressor complete with V-belt drive. Twenty-one tons refrigeration capacity.
Two stands 12 pipes high 20 ft. long atmospheric ammonia condensers complete with valves and stands. For use with above compressor.
One 12"x8 ft. ammonia receiver complete with valves and stands.

Write or telephone for price

The Vulcan Detinning Company
Neville Island Pittsburgh 25, Pa.

FOR SALE—ICE PLANTS & EQUIPMENT

30-35 Ton Ice Plants

1—10"x10" York ammonia compressor direct connected to a 60 H.P. synchronous motor 200 R.P.M.
1—10"x10" York ammonia compressor direct connected to 100 H.P. synchronous motor 200 R.P.M.
1—9"x9" ammonia compressor direct connected to 50 H.P. synchronous motor 200 R.P.M.
1—10"x10" York ammonia compressors 200 R.P.M.
1—Duplex 10"x10" Worthington Carbondale High Speed compressor direct connected to 250 H.P. synchronous motor.
1—6"x6" Voss ammonia compressor.
1—6½"x6½" ammonia compressor high speed with or without motors.
2—4"x4" York h.s. self contained units.
1—3"x3" Frick H.S. self contained units.
Shell and tube vertical condensers 36"x14"—162—2" tubes.
2—16" dia. x 10'-0 long 6 pass enclosed type ammonia condensers.
1—25" dia. x 10'0 long 5 pass enclosed type ammonia condensers.
Assorted sizes electric hoists ranging from 2 to 6 ton capacity.
1—Gifford Wood Uline Scoring Machine series No. 3.
1—Gifford Wood four tier, ice tiering machine.
2—Gifford Wood Creasy Ice Crushers, motor driven.
Assorted sizes of ice cans.
1—Sheppard—2½ Ton Crane—9 can grid.
Brine coolers, double pipe 2" and 2" horizontal brine coolers, submerged.
Shell and tube type 1¼" and 2" ammonia coils approximately 10,000 feet.
Send us your requirements on any equipment you may need.

Enterprise Equipment Corporation
77-79 Alexander St., Yonkers, N. Y.

Phone Yonkers 8-8118-9
Cable address: ENEQCO

"... your time is money"

... don't waste it by looking around for personnel or items to make your organization more efficient. A classified ad in Ice and Refrigeration will do the job for you quickly and at low cost. No matter what you need or have to sell, one of our readers will have it or want it. The same goes for personnel.

Rates are shown at the top of the page — closing date is the fifteenth of the month.

May we serve you?

USED ICE MACHINES AND EQUIPMENT

All Used Equipment Is Reconditioned in Our Modern Machine Shop

THIS IS ONLY A PARTIAL LIST—WRITE ABOUT ANY REQUIREMENTS WHICH YOU HAVE WE ARE BUYING ADDITIONAL EQUIPMENT ALL OF THE TIME.

Compressors With or Without Motors

	Item No.
1—4x4 York, 300 RPM	16
6—6x6 York's, 200 RPM	20
1—6x6 Frick, 257 RPM	21
1—6x6 York, 400 RPM, forced-feed lubrication	25
2—6½x6½ Arctics, 350 RPM, forced feed lub.	30
1—7¼x7¼ Baker, 350 RPM, forced feed lubrication	35
1—7x7 Frick, 200 RPM	40
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1—11x13 York, 164 RPM, forced feed lub.	90
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Diesel Driven and Diesel Engines

1—8x8 York—Direct connected to 50 H.P. Fairbanks-Morse at 257 R.P.M. 210

Steam Driven

1—8x8 Vertical York, 300 R.P.M. direct connected 327

Pipe

10,000 feet wrought Iron pipe—2"—like new 451

Complete Ice Plants

	Item No.
1—20 ton, 240 can, Diesel-driven plant	626
1—15-ton electric driven plant	630
1—600 Can Trunk Coil Type—York Plant, Brand New Tank. *Complete with 10 Can Grids. This plant is equal to new*	631
Brand New 8 to 10-ton Clear Ice-Making Plants—110 Cans—Electric or Diesel Drive—2 Can Pull	632
1—*247 Can, 22-ton ice plants, like new*	632A
1—35-38 ton New Clear Ice Making Plants	635

Self-Contained Units

3—4x4 York & Fricks	742
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1—34x10—100—2	802
1—48"x16'—130—2" tubes	808

Condensers

3—100 ton shell and tube condensers retubed	919
1—125-ton, Vertical Shell & Tube, 196 2" tubes	921
1—120 ton, 216—2" retubed Vertical Shell & Tube	922
2—20 ton Horizontal—retubed	924

Ice Cans

150—11½"x22½"x44"—cap refinished in zinc
500—11"x22"x47"—ice cans

NEW EQUIPMENT FOR IMMEDIATE DELIVERY

Compressors With or Without Motors

	Item No.
3x3 to 5 x 5 —390 R.P.M.	1001
6x6 to 10x10—390 R.P.M.	1002
3x3 to 5 x 5 —Self-contained units, complete	1003
5x5—Self contained—15 H.P. motor—V Belt	1004

Ammonia Condensers

4—12¾x12 Horizontal—36—1¼" tubes	1020
2—30x14 Vertical 109—2" tubes	1021
1—16"x10"x10' Shell and Tube Condenser, 60 1¼" tubes	1022

Ice Cans

50—100 lb. cans—15½"x8"x31"	1041
40—50 lb. cans—6"x12"x26"	1042

Ammonia Valves and Fittings

	Item No.
⅜" to ¾"—Screwed Expansion Valves	1050
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Check Valves	1053
Relief Valves	1054
Strainers	1055
Steel & Malleable Fittings	1056
Extra heavy Ammonia Nipples	1057

Ammonia Guages, Ammonia Receivers, Ice Crushers, Agitators, and Receivers and Oil Separators.

EASTERN REPRESENTATIVES OF PENGUIN AUTOMATIC ICE VENDING STATIONS

Robert P. Kehoe Machinery Company, Inc.

6 EUCKER ST. & BERGEN TURNPIKE
RIDGEFIELD PARK, N. J.

PHONE: HAckensack 2-8554-5
CABLE ADDRESS: KEHOEINC.

PROTECT

**TANK TOPS • LIDS • WALLS
MACHINERY • FLOORS
AND OTHER SURFACES!**

KEEP THEM CLEANER . . .

They'll Even Last Longer When Properly Painted!

CSCO

GREY PAINT

Is Made Especially For Ice Plant Service

GUARANTEED AS GOOD

OR BETTER THAN ANY OTHER PAINT OR COATING ON THE MARKET OR YOUR MONEY REFUNDED

CSCO Can, Coil and Condenser Coating is a Black Phenolithic Compound . . .

Excellent for coating ice cans above or below brine levels. Also condensers and all other surfaces immersed in either brine or water or exposed to the atmosphere.

PACKAGED IN ALL SIZE CONTAINERS

CHEMICAL SOLVENT COMPANY

3005—16th Street North Birmingham, Ala.

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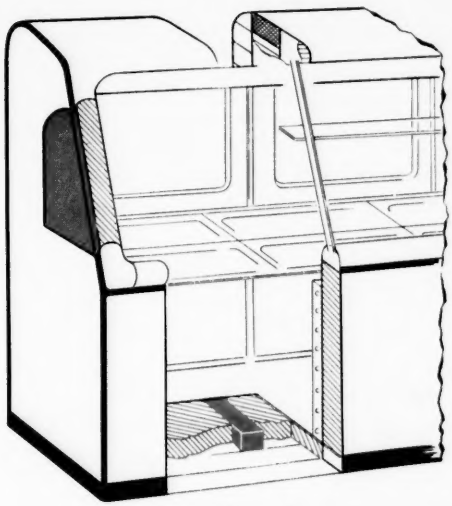

Fiberglas Aerocor insulates the vital zone at the top, where the small amount of space available for insulation makes high thermal efficiency important.

3" of 612 Fiberglas, 2½ lb. density, for maximum insulation efficiency at low cost.

1" of Temlok fiberboard insulation to back up and give rigidity to the end panel. Also used as load-bearing strips in the floor.

Here's how one manufacturer does it.

WHAT'S THE BEST INSULATION FOR A REFRIGERATED DISPLAY CASE?

There's no set formula for insulating refrigerated display cases. The choice of insulating materials and methods will be partly determined by whether the model is of steel or wood frame construction. Other factors, such as cost, weight, operating temperature, and interior dimensions must also be considered.

In the model above, three types of insulating materials are used. This combination insulates the case efficiently and adds strength to the design as well. However, with other types, such as the open top, self-service meat and frozen food cabinets, different combinations would probably result in the most efficient performance.

Armstrong engineers will be glad to help you select the best insulations for any model you manufacture. These men can be impartial in their recommendations, for they offer a complete line of insulations: LK® Corkboard, a rigid, load-bearing insulation; Temlok®, a strong, efficient fiberboard; and nine types of Fiberglas, the light, resilient glass fiber insulating material.

To prove the effectiveness of your insulation specifications before your equipment goes into production, we'll be glad to test it in Armstrong's Life Test Room. A few weeks here are equal to five years in actual use. There's no charge, and you get a detailed confidential report on your equipment's performance.

For full information on Armstrong's Equipment Insulation and Life Test Service, call the Armstrong office nearest you or write to Armstrong Cork Company, Equipment Insulation Dept., 4508 Queen St., Lancaster, Penna.

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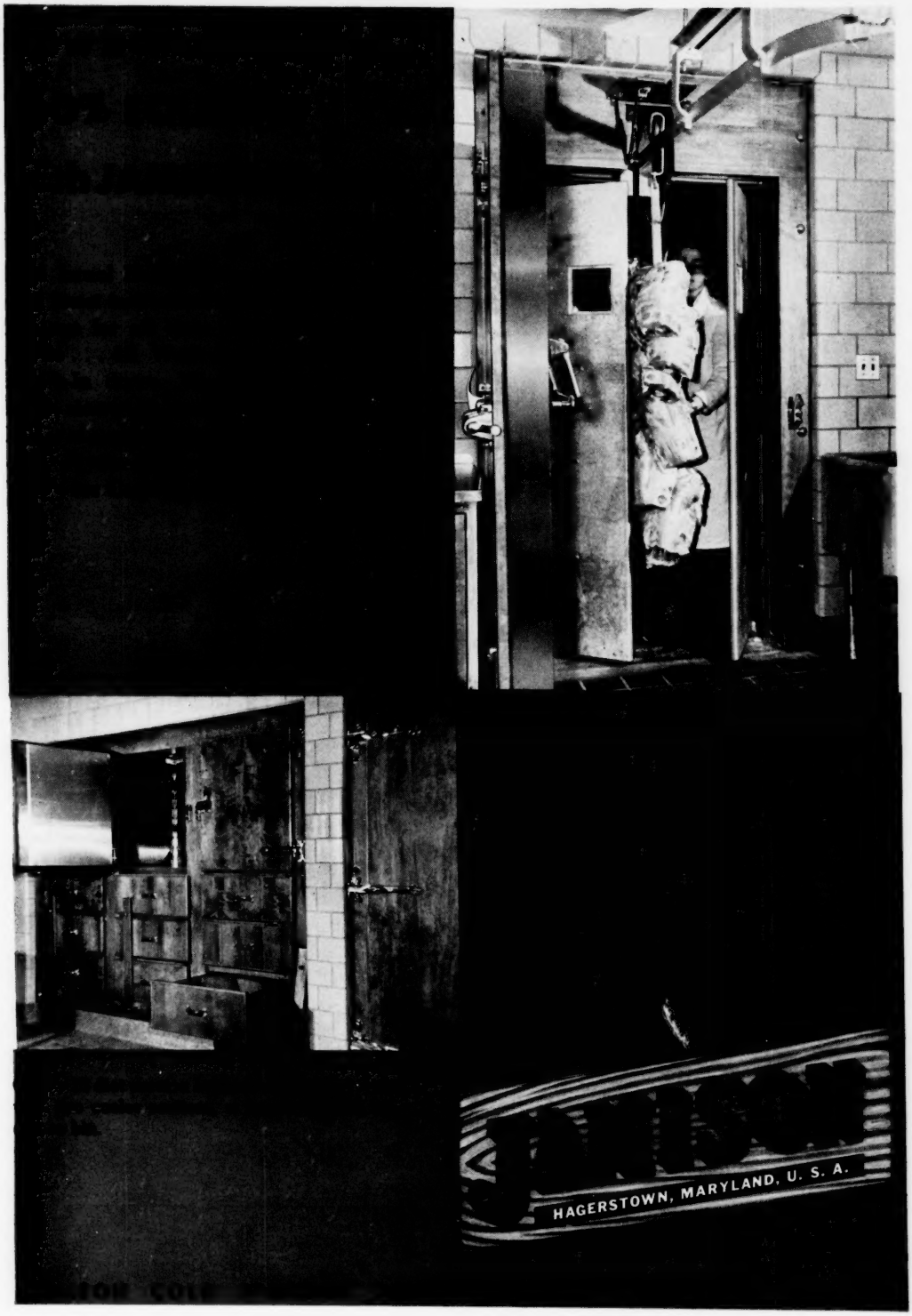
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